

of villages, with here and there a small town that is bigger than its neighbours. Roads run from each of the bigger centres to the smaller villages like spokes from a wheel ; these bigger centres are the market towns

During the greater part of the week, in some cases for six days out of seven, the market town appears to go to sleep, and few people are to be seen in the streets. But on one day in the week, market day, the place wakes up. The square in the centre of the town is filled with the produce of the country-side, the streets are crowded with men and women, animals and carts. The air is alive with the sound of laughter and greeting, of buying and selling. The hotels, inns, and shops are all busy, and the doctor and the dentist attend to numerous patients. Towards evening, everybody goes home. The roads are thronged with outward flowing traffic. Silence descends

upon the square, and restfulness settles upon the town. It has become, till the next market day, not much more than a big village itself.

Once or twice a year there is a most important kind of market, called a *fair*. Men come from long distances, pedlars and hawkers congregate, roundabouts and other amusements are provided, and there is an air of merriment, and an amount and variety of produce, not seen at the ordinary weekly market. These fairs began with holidays, and saints' festivals, and only became business meetings because it was known that at such times many people would certainly be gathered in one place. In



FIG. 1.—TOWNS AND VILLAGES OF EAST ANGLIA

some cases now, little or no business is ever done, and the fair has become simply a local holiday.

When the farmer has sold his produce, he goes shopping. Hence the shop-keepers of the market town have to be ready to supply him with the things he needs for his home and his farm. He buys not merely such things as clothes, groceries, and food, but seed, artificial manures, and agricultural implements.

"In dealing with agricultural machinery, it is necessary to bear in mind that they are not a homogeneous class, nor are they manufactured by one type of firm. The various machines and implements which the farmer uses, may be conveniently divided into the following classes—(1) *cultivating implements*, including ploughs, harrows, rollers, cultivators, drills, potato planters, together with such machines as potato diggers and turnip lifters, which actually work the soil in extracting the crop, (2) *harvesting machinery*, including reapers, binders, mowers, horse rakes, etc., all drawn along the surface of the land; (3) *stationary machines*, (a) grinders, chaff cutters, pulpers, etc., (b) threshing machines, balers, clover pullers, etc., (c) dairy machinery; (4) *engines* and motors of all kinds, self propelling and stationary, (5) machines used for drainage and other engineering works, including excavators, pumps, etc.; (6) sheep-shearing, and horse clipping apparatus. (7) spraying machines, etc.

"The extent to which any of the machines and implements within these classes is used, depends largely upon the size of the holding and the character of the farming carried on" *

The Large Towns.—The different tools and agricultural implements that the farmer requires, are often made in the market towns of the lowland. There are, then, besides the many villages and the smaller market towns a few large towns that are often manufacturing towns as

* Report of the Departmental Committee on Agricultural Machinery, Circular 200, 1920.

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well as markets. Amongst the largest of these towns, in the lowland are Norwich, Ipswich, Peterborough, and Lincoln. These towns have, or have had, special advantages. Markets must necessarily be at places where roads meet, but water roads were more important than land roads in earlier times, so that old market towns are generally found on rivers.

Norwich was at the head of navigation of the Yare, a waterway that led far into the interior of one of the richest grain counties of the kingdom. It is also at the junction of the Wensum and the Yare, so that it had waterways in three directions. Such a site was important even in Roman times, and the Romans had a settlement either here or in the neighbourhood. The Normans, in their turn, built a strong "keep" or castle which still exists, though now used as a museum. Round the castle, people came to live in safety and, as in so many similar cases elsewhere, a great cathedral was built. Norwich once had an important woollen industry, to which we shall refer later, and it still has manufactures that bring prosperity to the city. These include agricultural implements, and mustard. The mustard plant is grown in the Eastern Counties, and much is also imported from Holland, just "over the way".

Ipswich is at the head of the estuary of the Orwell, and at the point where the road from London to Norwich crosses the river. Below the town the estuary broadens out, and, when the tide is high, it has the appearance of a big lake. In the seventeenth century specially strong and durable ships were built here. These were used for fishing in Iceland, and for bringing coal from Newcastle to the south. It still has a considerable coasting trade in small vessels. Its walls, gates, and castle have disappeared, but there are quaint, rich houses that link us with an historic past.

Agricultural tools and machinery have been made here for more than a century, though originally manufactured to supply the needs of the district, they are now

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THE BRITISH ISLES

sent to all parts of the civilised world; connected with this industry there are now a number of iron foundries

In one part of the lowland there is a low ridge of limestone, which runs north and south, and prevents traffic from passing easily from east to west. In the

ridge there is a gap through which flows the river Witham. Now the Roman road from London to the north (Ermine Street) ran along the top of this ridge, in order to avoid the low, wet ground on either side, but it had of necessity, to descend into the gap to cross the river. Traders from east to west naturally used the gap, and through it passed another important Roman road (Foss Way), which connected Bath with the Humber. Although this gap was, and is, an important junction of land roads, it was in Roman times, and for many years afterwards, quite as important on account of its waterways: boats of five-feet draught can still get up the Witham. Not only was there the river leading to the sea, but there were

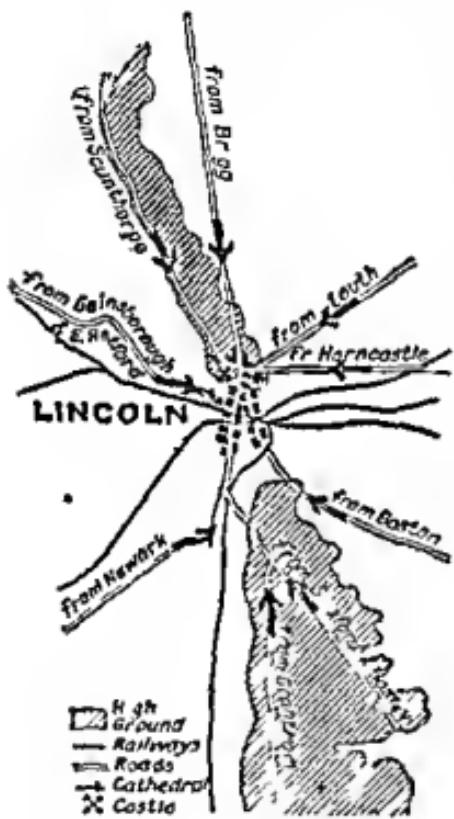


FIG. 2—MAP TO SHOW THE ROADS AND RAILWAYS WHICH MEET AT LINCOLN

dykes or canals that joined the gap with the Trent on the west, and the Welland on the south. These dykes were made for drainage purposes, but they were navigable by small boats.

To defend such an important junction, the Romans

PREFACE

It might seem that there is scarcely room for another series of text books of Geography for use in Secondary Schools. This may be so. The Authors can only say that these volumes have been written in response to insistent demands for a set of books on the same general lines as those of the Primary Series. As in that series, the volumes are human in outlook, progressive in difficulty, practical in method and attempt to develop a point of view. They include all that may be legitimately expected from children who proceed normally through a Secondary School Course. Everything of physical, economic, or political geography fits into place in the regional scheme, while the essentials of cartographic method are suggested.

The order of arrangement of the matter is somewhat unusual. This has been adopted with the object of covering the world regionally in three years, leaving free an introductory year or a final revision year for the world as a whole or both. A suitable course for the introductory year will be found in our "Human Geography: The World."

J. F.
L. Y.

December 1921

planted a colony, *Lin-coln*, on the top of the hill to the north of the gap. Here they kept stores and quartered troops, and for protection they built strong walls, parts of which still remain. In Norman times, the waterways were extensively used. Lincoln was then one of the most populous cities in England, and a great market for goods that were brought both by land and water. The Normans strengthened the defences of the junction by the erection of a castle, and under the protection of that castle was "built a church strong as the place was strong, and fair as the place was fair."

Like Norwich and Ipswich Lincoln once had a woollen industry, but this has departed. It was also once a port, but the silting up of the Witham now prevents big boats reaching the city. The houses have crept outside the walls, and down the hillside to the gap and a modern industry, the manufacture of agricultural implements has replaced the older one of woollen.

Where so many roads met in the past railways meet to day, and Lincoln is now an important railway junction with the stations on the floor of the gap.

It will be found that most towns are either connected with buying and selling, with manufacturing, or with governing. But *Peterborough* belongs to another, and smaller class. Its origin is neither commerce, industry, nor government, but religion. The site of Peterborough is in a corner of what was formerly low and swampy ground, but that corner was a little higher, and therefore drier than the rest of the surrounding country. In turbulent times, this spot of dry land amongst the marshes, quiet and secure, was a most suitable place for the erection of a monastery.

In the neighbourhood of the monastery lived the people who attended to the building repairs to the growing of food for the monks, and to many other duties connected with the life of such a place. This meant the beginning of a small settlement.

But Peterborough is on the Nen, and has water roads

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As a junction of land and water routes in a district where travel was then very difficult, it was a suitable place for exchange, and to the monastery we must therefore add a market. Thus we get the same kind of story we have told for the other market towns in this agricultural area—protection, settlement, market, cathedral, manufacture of agricultural implements, railway junction. And we must add, in this case, bricks made from deposits of local clay, and finding a ready market in London.

We have carried the grain to the market and the mill. It remains to be seen what is done with the straw that is left over when the wheat has been threshed. Some of this is converted into plait for the manufacturer of straw hats. The centre of this industry is *Luton*, the straw of the neighbourhood being specially suitable. The industry has grown to such an extent that the local supply of straw is insufficient to meet the demand of the factories, and large quantities are now imported into London from China and Japan.

This foreign straw, or straw plait, is sent thirty miles from London to Luton by train, and made into straw hats, which are then sent back again to London to be sold. It appears at first sight as though it would be simpler to make the hats in London, and save the cost of railway carriage both ways. If the manufacture of straw plait and hats had always been carried on by means of straw brought from abroad, this is probably what would have happened, but the manufacture began at Luton, and there it remains. Once an industry springs up in any place and gets a firm hold there, it is hard to displace it, even if conditions change.

Conditions for Wheat Growing in the East of England.—Wheat is not grown everywhere, as may readily be seen by examining a map showing the wheat growing parts of our islands. There must be some special reasons, for instance, why so much is grown in the east of England.

(1) *The Soil and the Ice Age*.—First of all, there is the soil. In East Anglia the soil is largely the result of

HUMAN GEOGRAPHY THE BRITISH ISLES

CHAPTER 1

THE WETLANDS OF EASTERN ENGLAND

The Variety of the Earth and its Inhabitants.—When we look round the world we inhabit we are struck with the variety of its inhabitants and with their different ways of living. Each group of people tends to think that the others are rather peculiar, some even going so far as to call them stupid. But, as Leigh Hunt remarks, "There is no surer mark of a vain people than their treating other nations with contempt, especially those of whom they know least. It is better to take everything unknown for magnificence, the gain is the greater."

What is good for one land or nation is not necessarily good for another, there are many ways of living and of living well, and one of the objects aimed at in studying geography is to see how the people of the world manage to make the best of the conditions under which they have to live.

There is no need to go abroad in order to discover that happiness and well being depend to some extent upon one's surroundings. Even within the boundaries of the British Isles, men and women do not everywhere live and work in the same way, and in this book an attempt will be made to show how very natural it is that this should be the case. Our first study will be of the flat land in

conditions that existed perhaps 200 000 years ago and possibly longer. At that time a very large part of northern Europe was buried under a thick sheet of ice. This epoch is known as the Great Ice Age. From the high lands of Scandinavia enormous ice sheets travelled slowly down to the lower lands of Russia, Poland, North Germany, Denmark and the British Isles.

These ice sheets carried with them large pieces of rock, those that reached us from Norway, for instance, brought with them huge fragments of Norwegian rocks which were afterwards deposited on the east coast where they remain to this day the silent witnesses of their ancient wanderings.

As the ice moved over the land it ground the rocks beneath it into powder and mixed this powder up into a kind of rock flour which now forms fertile clay. In East Anglia then we have in many places a clay soil known as *boulder clay*. Now wheat grows best on a firm clay soil and in this soil we

* A boring in Boston (Lancs.) market place gave—

	Below surface
Man soil sand and gravel	11 ft
Clay	5
Stone, rubble and chalk	3
Clay with hard stones	1.3
Clay and silt	2.3
	—
	4.3



FIG. 3.—THE CHIEF WHEATLANDS OF THE BRITISH ISLES

the east of England the part of the country that grows the greatest amount of wheat

Wheat Farming —The first operation is ploughing which destroys weeds breaks up the soil, and tends to keep moisture in the ground. The old and still common method is with horses but there are now motor tractors which are replacing horses for much of the work of the farm which each haul ploughs that turn several furrows at a time and work a hundred times as fast as a man. The size of the plough depends to some extent upon the character of the ground big ones, cutting many furrows can be used only on fairly level land.

The ground is harrowed to prepare a seed bed and then the seed is sown. The sowing was formerly done by hand, the seed being thrown broadcast, but this was a wasteful method and the work is now usually performed by machines which use less seed and sow it in straight lines at regular distances apart.

Wheat should be sown as soon as possible after the end of September, in about a fortnight the first leaves appear for the soil is still warm, the young plant gets a good hold in the soil and is able to withstand the cold of winter. It spends the winter developing its roots and does not grow much above ground till the spring. Weeds have then to be removed, either by hand or machines and the ground rolled to prevent rain washing the soil from the young roots and also to prevent loss of moisture from the earth.

First the blade then the ear after that the full corn in the ear and so to the time of harvest about August. The work of harvesting was at one time performed by hand with sickle or scythe but modern machines are now used which cut the corn bind it into sheaves and leave these sheaves at regular intervals in the fields. The reaping machines have long knives working in an outer case travelling close to the ground and as these knives would be broken if the ground were hilly or bumpy the use of reaping machines is largely

find our first reason for the presence of the wheatfields in the east

But the soil is not everywhere of this nature, and when it is sandy, barley is grown in the place of wheat

(2) *Rain* — The kinds of crops grown in any region also depend on the amount of the rainfall, and upon the period of the year when the rain falls

The chief winds in these islands come from the west and the south west, they blow, on an average, two days out of three. They come over the Atlantic Ocean and are full of water vapour. On reaching the high land that lies in the west of Britain they are forced to rise. As they rise, they get cooled, and a great deal of the moisture which is in them is condensed and falls as rain. When the west winds have passed over the mountains they descend and are warmed. Little or no moisture is given up and the amount of rain that falls gets less and less as we reach the east coast.

As for the winds which sometimes blow from the east they are fairly dry to begin with, as they have come across the continent of Europe further, they are not compelled to rise when they reach the eastern shores, for this part of the country is mostly at a low level. Hence the east winds also bring little rain to the east coast. But the east is, nevertheless not a desert. Some rain does fall, for reasons which will be explained later, and the amount is enough for wheat, which requires less than most other crops.

(3) *Temperature* — Then there is the temperature, this is measured by means of a *thermometer*, and for some purposes, recorded as explained below.

During the month of September, 1920 a thermometer at Little Massingham (Norfolk) was read every morning at nine o'clock. The readings were as follows: 1 54, 2 55, 3 59, 4 59, 5 52, 6 61, 7 55, 8 62, 9 68, 10 59, 11 53, 12 58, 13 65, 14 54, 15 59, 16 52, 17 51, 18 58, 19 51, 20 48, 21 49, 22 55, 23 54, 24 54, 25 55, 26 57, 27 55, 28 57, 29 57, 30 55.

confined to fairly level ground. After the sheaves are dry, they are threshed to remove the grain from the straw. A hundred years ago threshing was done with the flail and employed much labour during the winter time, but in this country all threshing is now done by machinery, driven as a rule by steam. Only the larger farmers possess their own machine. The smaller farms utilise the services of machines which travel about the country each with its own team of workmen. The machines thresh about a hundred bags a day, and the more modern of them dress it at the same time, so that they deliver it, as it were, ready for sale.

In order to sell it the farmer carries samples to the nearest market town, where he shows them in the corn hall or corn exchange, first to one merchant, and then to another. The buyer keeps the sample, and the farmer delivers wheat of like quality.

Sooner or later the wheat is delivered at a mill. The older mills were often windmills, whose long arms caught the wind, revolved, and so set the grinding rollers to work inside the mill. Others were worked by water, which fell upon a big wheel outside the mill; this turned slowly round, and gave motion to the grinding-stones within. But now all the most important mills are worked by steam; if less picturesque they are more regular in their action than the older forms.

In modern mills the flour passes between a number of steel rollers. The grinding removes the husk as bran, and converts the inside of the grain into flour. The bran and flour are separated by sifters which send them down different shoots into sacks ready to catch them. The flour sacks, when filled, are forwarded to the baker, where they may conveniently be left.

Villages, Ancient and Modern.—It is clear that if the land is to be given up to agriculture, there are not likely to be many very large or important towns in the district. Men live chiefly in small villages, which are very much alike in many ways. There is usually a short

On a piece of squared paper, two lines are drawn at right angles. On the horizontal line, are written 1, 2, 3, etc., referring to the days of the month. On the vertical line are written 30, 40, 50, etc., referring to the scale of the thermometer. On the first of September the thermometer at Little Massingham at nine o'clock in the morning, stood at 54°. On the vertical line numbered 1 this temperature is marked by a small dot. The process is repeated day by day, and in this way a series of points is obtained. The points are joined to each other and a crooked line is obtained which shows the rise and fall of the thermometer at Little Massingham for the month.

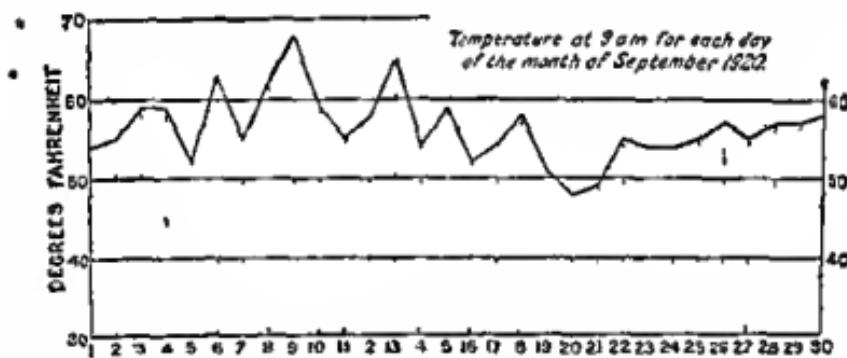


FIG. 4.—TEMPERATURE AT LITTLE MASSINGHAM (NORFOLK) SEPTEMBER, 1920

of September, 1920 at nine o'clock each morning. Such a record is called a *temperature chart*.

But this record gives the temperature only at one particular time and the temperature varies a great deal throughout the day. The highest temperature reached during the day is called the *maximum* temperature, and is registered by means of a maximum thermometer. The lowest temperature reached during the day is called the *minimum* temperature, and the thermometer that registers it is called a *minimum thermometer*.

If the maximum temperature for a day be 68° F., and the minimum temperature for the same period be 50° F.,

main street with cottages on either hand, two or three shops, a blacksmith's forge, a public house, a school, a parsonage, and a church. Such a place does not change very much as the years go by. But seven or eight hundred years ago the conditions of life in the village, and on the farm were very different from what they are to-day.

There was the big house, and the park of the Lord of the Manor, and there were cottages, as there are now. Beside the village were the cultivated fields, and common land. The fields were divided into long strips, and were given to the villagers in such a way that everybody got a fair share of both the good and the bad land. Part of the produce was sent to the Lord of the Manor, and most of the villagers had to work for their lord, without payment, at certain seasons of the year. This served instead of rent.

Each village lived unto itself: grain was grown in the fields for bread and beer. On the common land, cattle and sheep were grazed, and poultry were reared. In the wooded land, fuel for fires, acorns and beechmast for pigs were obtainable. From the animals that were reared came milk, cheese, meat, hides, and wool. The hides and the wool were made into clothes at home. The people built their own homes with timber from the woods, and thatched them with straw from the fields.

For reasons which are set forth in history text-books,* all this has vanished, and now farms are big and not small, they are surrounded by hedges, and most of the work is done by men who earn wages, and with the wages buy the clothing and food that they need. There are other changes, some of them for the better, for the wages are now generally good, the houses are drier and healthier, and there are many comforts which our ancestors knew nothing about.

Market Towns and Market Days.—A map of the wheatlands of Eastern England, shows a large number,

* See *England in Her Days of Peace*, E. V. Dooly C. Philip and Son

then the average of the two is 59° F . This is found by adding together the maximum and the minimum temperatures and dividing the sum by two. We sometimes call this average the *mean temperature* for the day, but the mean temperature for the day would really be more correctly found by reading the thermometer every half hour or quarter of an hour or even every minute. This however would give a great deal of work and the average of the maximum and minimum temperatures is usually very nearly the true mean temperature and is commonly taken as such.

If we add together all the mean temperatures for each day of the month and then divide the sum by the number

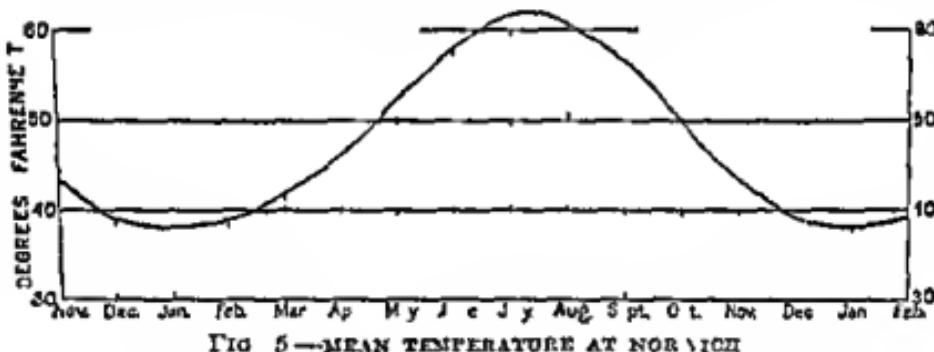


FIG. 5—MEAN TEMPERATURE AT NORWICH

of days in the month we get the *mean temperature* for that particular month.

If we add together the mean temperatures for each day in the year and then divide the sum by 365, we get the *mean temperature for the year*.

The following table gives the *mean temperature* for each month of the year at Norwich. The figures were obtained by adding together the mean monthly temperatures for each month for a period of 30 years and then dividing the sum by 30.

These monthly means are much more useful than the daily means for if we are going to compare the temperatures at different places we need something more easily

worked with than a series of temperatures taken every day

J	F	M	A	M	J	J	A	S	O	N	D
32.4	35.8	41.7	46	52.4	57.7	61.3	60.7	59.7	49.5	43.1	38.8

Fig. 5 shows the variation in temperature at Norwich as given by the above figures and also illustrates the way in which the temperature gradually rises and falls throughout the year.

We have now some means of comparing the temperature of the east of England with the temperatures of other districts for the mean temperatures of different parts of the British Isles have been calculated in the same way as those of Norwich. When they are compared, it is seen that though East Anglia is colder than most parts of Britain in winter it is warmer in summer. The winter cold helps to break up the surface of the ground and the summer heat helps to ripen the grain.

The region treated of in this chapter has now been shown

- 1 To be low lying and fairly level so that movement across it is easy
- 2 To have a fair but not a heavy rainfall
- 3 To possess a temperature that varies a good deal and is high in summer
- 4 To have a soil of fertile boulder clay

Now all these conditions are such as suit the growth of wheat and it is not therefore an accident that so many of the people of the region are wheat farmers or interested in farming.

THE BRITISH ISLES

Shade the wheat area. Do this by drawing strokes with the hand, *not with the ruler*. Be careful to put underneath the map what it shows and explain any signs you use.

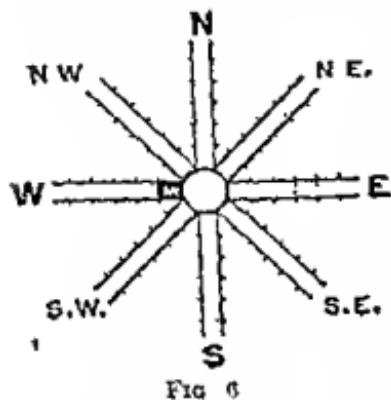


FIG. 6

3. *Temperature Chart* — Pin up on a drawing board a large sheet of squared paper. Every day, for twelve months, read the maximum and minimum thermometers at some given hour and record the results on the paper. Join up the points and observe the way in which the temperature varies throughout the year.

4. *Wind Chart* — On a large sheet of paper draw lines crossing each other as in Fig. 6 and call them by the eight points of the compass. Every day at a given hour see in which direction the wind is blowing and fill in one of the squares along

the appropriate lines beginning near the centre where the eight lines cross. If the sky is clear, colour the square red, if dull, blue, and if rain is falling, black. Then note as the days go by

- (a) Which are the commonest winds?
- (b) Which are the wettest winds?
- (c) Which are the driest winds?

During the course of our studies, we shall have to return to this matter; transhumance is not everywhere due to the same causes.

Routes and Market Towns —The fact that the sheep can be moved from the low land to the hills points out another difference between the flat wheat lands of the east and these orchard and sheep counties of the south east. The south east is hillier than the east, and it would not, on this account, be generally so suitable for such operations as reaping with reaping machines. The map (Fig. 9) shows the curious arrangement of the higher land. The chief hills are the North Downs and the South Downs, which are of chalk with the sandstone heights between them.

But the chalk hills are not quite continuous; they are noticeable for the number of comparatively narrow passages or gaps which cut right through them. These gaps are of the greatest importance, for it is through them that the roads and railways pass from the coast to London. Most of them have streams flowing through them. There are eight important passages from one side to the other of the North Downs between Farnham and Canterbury.

Now before tunnels could be made all the traffic which passed from one side of the chalk to the other was practically bound to pass through these natural gateways. And therefore almost every gap is a point where roads, both natural and artificial, meet. Hence these spots were, and are, natural places at which people met and meet to exchange their produce, that is, they are the natural sites of markets.

As people got in the habit of meeting at a fixed spot on regular days for the exchange of their wares, it became the custom to erect refreshment booths for their convenience, these in time gave way to the inn. At such a place the blacksmith would find plenty of regular work, and the inn was followed, or even preceded, by the smithy. Other trades found it profitable to live where they could buy and sell, and the roads at the

CHAPTER II

SOUTH EAST ENGLAND

A man named Lambard writing of Kent in the year 1576, says It hathe Corne and Graine common with other Shires of the Realme as Wheat, Rye Barly and Oats, in good plenty

"Neither wanteth Kent such sorts of pulse as the rest of the Realme yieldeþ namely beanes peason, and tares

"The pasture and meadowe is not onely sufficient in proportion to the quantitie of the countrv it self for breeding but is comparable in fertilitie also to any other that is near it in so much that it gayneth by feeding

"Touching domesticall cattel as horses mares oxen kine, and sheepe Kent bringeth forthe the largest of Stature in eche kinde of them

"In fertile and fruitfull woodes and trees this country is most flouryshing also, whether you respecte the waste of oke, Beeche or Chesten for cattail or the fruit of aples Peares, Cherries, and Ploumes for men, for besides great store of oke and beeche, it hath whole woodes that beare Chestnutt But as for Orchards of Aples and Gardins of Cherie, and those of the most deliciouſ and exquisite kindes that can be no part of the Realme (that I know) hath them either in such quantitie and number or with such arte and industrie set and planted "

This ancient description of Kent is still true and applies also, in large measure, to the other parts of that south eastern portion of the country with which this chapter

meeting place were lined with houses. When enough people had settled in one place, a church was built, if one was not already there, and the market in due time became a market town with a market-place in the centre.

The old roads ran along the dry chalk downs and so avoided the marsh and forest, but nowadays as it is easier to move about on the low than on the high ground, the modern roads are mostly on the low ground, and run east and west, on either side of the Downs. The connections between them are made by using the gaps through which

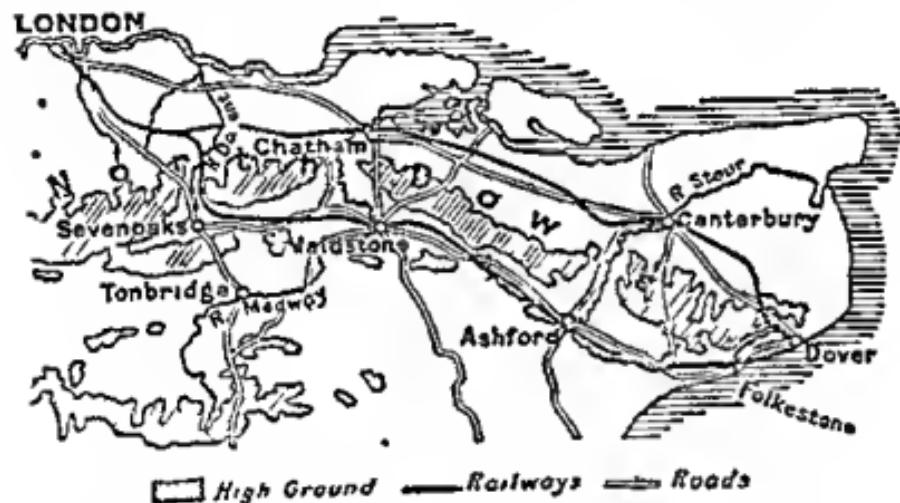


FIG. 10—MAP TO SHOW THAT THE ROADS AND RAILWAYS FOLLOW THE LOW GROUND

the roads and railways can easily pass. At each gap is a town—sometimes there are two towns, one at each end of the gap, where the hills are broad, as between Ashford and Canterbury.

Owing to the way in which Kent juts out into the narrow sea, it confuses the tides and makes the straits a dangerous place to cross especially to the small sailing boats of earlier days. It was necessary to provide the sailor with as many harbours of refuge as possible, and there are, or were, just on the corner, no fewer than

deals. It is evident that we are in a different kind of land from that studied in the preceding chapter; here are not only wheat and barley, but fruit, hops (not mentioned above), and sheep.

Fruit.—Those of us who grow a few apples or pears in a garden, can have but little idea of how unbroken are the labours of those who supply our tables with their successive supplies of fruit. In the spring, the stems of fruit trees are covered with lime to destroy blight; in the summer and autumn there is the picking—strawberries in June, cherries in June and July, plums in August, apples and pears in October and November. In late autumn, the trees must be pruned to prevent the growth of too much wood. During the winter the trees are examined, one by one, to see whether they are in good condition or not.

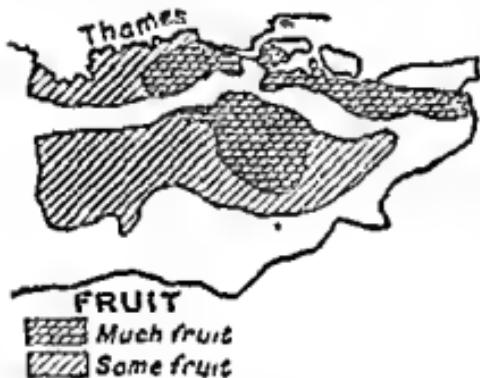


FIG. 7.

In the case of apples a great deal has to be done besides gathering. Trees have to be planted and tended for some time

before they bear fruit. It takes many months preparing the ground for an orchard and planting the trees. Each tree has to go in its proper place, and that is not so easy as it looks, for they are arranged so that they grow not only in rows at right angles, but in diagonal rows as well. The place for each tree must be prepared very carefully, for once it is planted there will be no chance of remedying mistakes. In autumn and winter each tree has to be pruned, grease-banded and lime-washed to catch or destroy harmful insects which would injure the tree or its fruit in the following season. In the spring the ground may have to be broken up between the trees. Then the apple crop has to be gathered, beginning with the early varieties.

seven small ports. These were, in order, Reculver, Ramsgate, Richborough, Sandwich, Dover, Folkestone, and Lympne. Most of them were bad and artificial, but there they were.

It is evident that when a man may have to land, according to wind and tide at any one of six ports, it is a great convenience to have a common centre where all the roads from them can meet. There are several spots that might have been chosen, but only one of these is beside a river which passes through the heights and therefore leads to a gap, at the gap the roads from the ports can meet the roads through the hills.

This point is Canterbury on the Stour. But Canterbury is not exactly at the gap, it is six miles further down the stream. This was a more convenient site for in early times Canterbury was a port, and so was situated at the place reached by the tide. The presence of the tide coupled with the presence of fresh water flowing from above the city, seems to me to have decided the matter. *

Like most of the other towns mentioned above, this place was early fortified and though Caesar landed at Deal he had to take Canterbury first before he could proceed. In later times a castle was built, houses were erected under its protecting shadow, and a wall was put round the houses with gates that could be closed at nightfall for further protection. It must not be forgotten however, that walls like castles were sometimes built

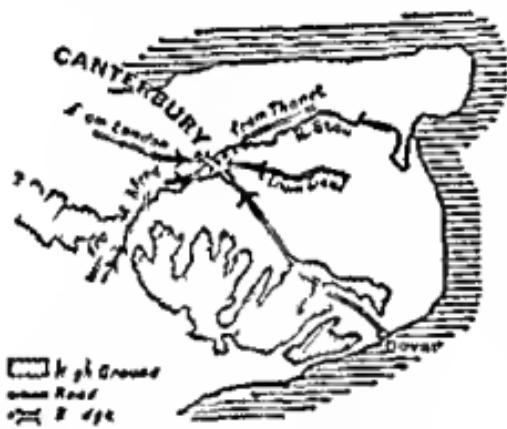


FIG. 11.—MAP TO SHOW HOW ROADS MEET AT CANTERBURY

in June or July and continuing with later and later sorts till the autumn. All this has to be done by hand and so takes time.

Then there are the cherries which are usually sold on the tree at auctions held locally early in June. The buyers make their bids according to their ideas of the weather in the future and have to stand the risk of loss if a bad season ensues. The season lasts till the end of the first week in August, one variety of cherry succeeds another and trees on high ground are often ten days later than those which stand on lower and more sheltered ground.

Picking cherries is a dangerous occupation for the men have to climb by means of long white ladders to the tops of trees that may perhaps be thirty feet high. The ladder leans not against one solid bough but on the general mass of branch and foliage and the workman has to pick the fruit hidden among the leaves stretching from side to side to the full reach of his arms. But accidents are few and not more than one picker in a thousand gets hurt each year. The work requires skill and experience and expert pickers receive high wages.

Sheep chickens and pigs wander about in the orchard keeping the grass short for hay and cherries cannot both be successfully grown on the same ground. During a week of sunshine the Kent cherry district is a region of great contentment. Everybody does well and even the 'bird munder' goes singing to the accompaniment of his tin filled with pebbles or the old frying pan which he beats with a stick.

As for the strawberries there are few crops that require so much careful culture. They need attention from the autumn of one year to the midsummer of the next. The soil must be prepared the young plants set out in straight rows at regular distances apart and weeds removed. At a later stage straw must be put down between the rows to prevent the berries from becoming gritty by trailing on the ground.

to awe the people rather than to protect them, and it seems probable that the cost of keeping up these defences was often a serious burden to the townspeople. Considerable portions of the Canterbury wall still remain, as does also the beautiful West Gate at the outlet of the road from Dover through Canterbury to London (Watling Street).

When the Christian missionaries under St. Augustine landed at Richborough, they made for the first important town near to their point of arrival, and there set up their headquarters, and their church. The head of that church afterwards became the Archbishop of Canterbury, and the Primate of the Church of England. The famous cathedral is built over the site of Augustine's first church, though no traces of the ancient building are visible.

The people of Kent were extremely proud of their city; hence the name—Cant-warn-byrig—that is, the town of the men of Kent.

One way from Dover to London goes through Canterbury, on the north side of the North Downs. There is another road, however, on the south side of the North Downs, which meets one passing through the hills by means of the Medway gap. At this point meet land routes from Rochester and Chatham, London, the Weald, Rye, and Dover, and the water road provided by the Medway. Such a point is of obvious importance, and there is the usual story of castle, market, and church at Maidstone.

Further west, the Wey flows through another gap, and here is Guildford where the old castle still remains.



FIG. 12.—MAP TO SHOW HOW ROADS MEET AT MAIDSTONE.

A field of ripe strawberries, with its rich green leaves and bright crimson berries, is good to behold. But the work of picking is a back-aching business, the picker stands astride the row, and, because the plants are near the ground, has to do the work in a stooping position. Much care has to be taken to avoid bruising the fruit, or damaging the plant, and the same pickers are often engaged year after year, because they have become skilful by long practice. As all the fruit does not ripen at the same time, a field may have to be gone over many times.

The strawberries are placed in round shallow baskets, which, with their contents, weigh from four to five pounds. The carts in which the baskets are conveyed to the railway are fitted with shelves to prevent the fruit being crushed, as it would be, if one basket were placed on the top of another. A strawberry van will often have a load of from 500 to 600 baskets, and on busy days as many as 40,000 baskets will be sent off from a single station.

Hops.—More hops are grown in the south east of England than in any other part of the country. As they have weak twining stems they require supports. Formerly poles were used, but it is now more usual to allow them to grow up strings as in this way they obtain more light and air, and less labour is required in the gathering.

Poles about twelve to thirteen feet high are placed in rows about twenty feet apart. Wires are fastened so as to connect the tops of the poles with all their neighbours, and another wire is carried along the rows, at a height of about five feet from the ground. From the stump of the hop plant, strings are taken to the lower wire, and then slanted to the top wire in the next row of poles. This arrangement is made in order that as much sunshine as possible may be received.

The hop plant naturally grows straight up, and a great deal of labour is expended in making it keep on the slanting strings. No crop is more affected by the weather, or more subject to destruction from blight and other

Even in our times Guildford is an important place from a military point of view, and there are strong military forts on the hills above the town to guard London, which lies at the other end of the roads that begin at Portsmouth and Southampton.

And yet Guildford is not a large town, and that leads to the question why some gap towns should remain small, while others become large and important. The reason is never simple, but we may compare, for instance, Lincoln and Guildford. The *Wey* gap joins two portions of

the country that have wide barren tracts of sandy ground that produce very little, the market at Guildford is small. The *Witham* gap connects two rich agricultural districts that produce a great deal, the Lincoln market is large. Then Lincoln is only twenty-five miles from a coalfield, Guildford is eighty. This is not the whole story, but while Guildford has remained a small market town Lincoln contains 66,000 inhabitants, and is an important market and manufacturing centre.



FIG. 13.—MAP TO SHOW THE POSITION OF LEWES IN A GAP WHERE ROADS MEET

There are five gaps through the South Downs, each with a river flowing through it, but few of the towns at the gaps are of any importance. We will consider the situation of *Lewes* only. Lewes lies in a narrow gap in the main ridge of the South Downs and is built partly in the gap, and partly on the western hill. At this point the Downs, instead of running to the east, turn more to the south east to meet the sea in the cliffs of Beachy Head. Hence the gap serves as a passage, not only from south to north, but from west to east as well. The railway line from Brighton to Dover and other points on the south coast

pests. On the other hand, the profits are high, and averaged, in pre-war years, about £10 per acre, though profits of £100 per acre have been known.

The flowers, which are the parts required, are gathered in September, and taken to an *oast* house to be dried for market. These houses are of brick, conical in shape, and capped with cowls which swing with the wind. The work of drying, cooking, and packing, requires skill and care, and during the busy season the men in the oast houses may be employed both day and night.

Anthracite, charcoal, and sulphur are burned in the oast house in order to give to the hops the beautiful golden or brownish colour which is demanded in the best quality.

In order to bring the hops under the influence of the fire, a kind of latticed floor is placed just below the opening of the conical roof; a hair cloth is spread on this and allows the warm air to

pass freely through it. Layers of hops are placed on the cloth to a depth of several inches; from time to time they are turned over by means of large light shovels, in order that they may all be thoroughly dried. Close by the drying floor is the cooling floor, where the hops are placed before they are packed in long canvas bags, called pockets. The hops are sold to the brewers, who use them to impart a bitter flavour to beer.

Conditions for Fruit Growing.—We have now to seek for the reason why the people of this corner of England should find it easy to grow not only fruit, but the variety of other things that can be grown on the soil.

(1) **Soil**—Cobbett, who used to ride about on



FIG. 8.

has been made to forsake the coast, run north-east to the Ouse gap, and then pass along the north side of the South Downs shut off from the sea. In former times the gap had great military importance and was fortified; parts of the ruins of the castle still remain.

The Fruit Market—As ripe fruit will not keep long, it has to be conveyed to market as speedily as possible. For such a purpose fast trains and fast motor vans are invaluable. The chief market for the fruit is London; some is sold fresh at Covent Garden, but a great deal is converted into jam.

The railway that connects the fruit lands with London is the South Eastern and Chatham. It has two main lines. one runs on the north side of the North Downs and goes through Chatham and Canterbury to Dover; the other runs on the south side of the North Downs through Reigate and Tonbridge to Folkestone and Dover. These two lines are connected at different points by branch lines that pass through the gaps. Fast trains are specially run during the busy season, and fruit which is picked in Kent early in the morning, may be on sale in Covent Garden in a few hours. This market is supplied from a much larger area than the little market towns.

EXERCISES

1. Draw a map of South East England (Fig. 9), and colour it to show where there is chalk, sand, and clay. See p. 22.

2. Draw another map of the same area and colour it to show the land over 600 feet. Put in the rivers that flow through the gaps, and the main railway lines. Mark all the towns that stand at the gaps. If they have or had castles put + by the side of the name.

3. The mean monthly temperatures for Dover and Barnstaple are given in the appendix. Both places are on the coast, and both are about equally distant from the equator, but one is near the continent, and the other is open to the Atlantic. Plot two curves on the same paper (Dover, red, Barnstaple, black) to show the variations in temperature.

(a) Which place has the greater range of temperature?

(b) What is the range in each case?

horseback, visiting all parts of the country, speaking of one part of our area in his *Rural Rides*, says, "It is a district of meadows, cornfields, hop gardens, and orchards of apples pears, cherries and filberts with very little land which cannot be called good. There are plantations of chestnut and of ash frequently occurring," but of another part of the area he remarks, "nothing grows well but oak trees." These differences, so close together, are due to the differences in the soil.

A journey from the Thames, in a southward direction, leads over the chalk hills of the *North Downs*, then into the *Weald* where there is a belt of clay, then a central ridge of sandstone then another belt of clay, and so to the *South Downs* which are again of chalk.

The chalk lands produce chiefly grass, the clay lands

chiefly oak trees and pasture, and the sandy lands chiefly heaths and pine woods. Speaking of the clay lands of the Weald Cobbett says

'Here the land is a stiff tenacious loam at top with yellow and blue clay beneath. Here the oak grows finer than in

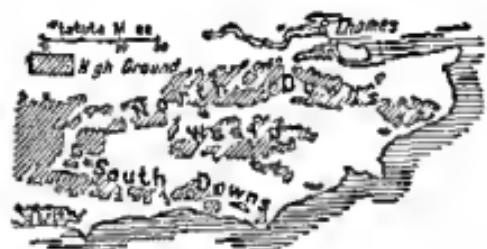


FIG. 9.—SOUTH OF ENGLAND: HIGH GROUND

any part of England. The trees are more spiral in form. They grow much faster than upon any other land. Yet the timber must be better, for, in some of the Acts of Queen Elizabeth's reign it is provided that the oak for the royal navy shall come out of the Weald.' The word Weald is Saxon for 'forest'. In Roman and Saxon times the whole region was covered with trees but little remains to day of the once extensive woodlands.

In many places the soil is mixed, that is it contains many varieties of mineral food. These are the fertile parts where the fruit and hops are chiefly grown. 'Hops will grow well when there is a rich top and a dry bottom.'

CHAPTER III

THE PENNINE MOORLANDS AND THE LAKE DISTRICT

IN the north of England a broad mass of high land stretches from the Cheviot Hills on the border of Scotland, to the valley of the Trent in the south of Derbyshire : it divides the low land on the east from the low land on the west, though at one place, called Shap Fell, it joins high land on the west. This broad mass is usually called the Pennine *Chain*, in reality it is not a chain at all, but a plateau cut up by deep valleys. It is a kind of land quite different from those studied in the two preceding chapters.

The Ascent to the Moorland.—By means of one of the valleys mentioned above, it is possible to ascend to the high moors. The mouth of the valley where it meets the plain is wide, and on the lower ground are woods, cornfields, and green quickset hedges, but further on, the valley gets narrower and narrower and is called a *dale*, and here the character of the scene is changed.

Trees are found mostly only in the river valleys, where there is shelter from strong winds and a fair amount of soil. In the higher parts there are neither trees nor cultivation ; it is too cold. The hillsides are clothed with short grass, and the air is musical with the bleating of sheep as they wander over the lonely land. There are no longer villages ; only scattered farmhouses.

Everything is of stone, for wood is scarce, and stone is plentiful. All the fences on the higher ground, and many of those on the lower, are built of stones.

When, therefore, you see hops in the Weald, it is on the side of some hill, where there is sand or stone at the bottom and not where there is real clay beneath"**

(2) *Rain*—We are still in the dry east, but there is more rain in south east England than there is in the eastern plain. As explained in the last chapter, the rainfall of Britain depends chiefly on the moist south-westerly winds which blow from the Atlantic. The area we are now studying, is partly exposed to these winds, and so is wetter than the eastern plain, though not so wet as the mountainous parts of the west and south west.

The coast and the low clay belts have the least rainfall, the Downs are wetter for they cause the moist winds to rise, and as the latter are then cooled, they deposit a great deal of their moisture. In the Weald the rainfall is a little lower except along the summits of the central ridge. Comparing the south east with the east, we find the former wetter than the latter, and this accounts for the greater abundance of trees, plenty of rain usually means wooded land, and not wheat or grass.

(3) *Temperature*—Land loses its heat more quickly than water, hence, places that are near the sea are kept warmer in the winter than they would otherwise be. Land gains heat more quickly than water, hence, places near the sea are kept cooler in summer than they would otherwise be. How does this affect south east England?

This region is so close to the continent of Europe that its temperature is affected by that of the continent itself. In the winter, Europe rapidly loses heat, and any winds that then come to us from the east are very cold. This does no harm to the fruit trees. The leaves have fallen, and the buds are warmly protected. As a matter of fact, the cold winds actually do good, for they harden the wood and kill various pests that otherwise would do considerable damage later on. In summer the continent rapidly gains heat, and any winds that then reach us from that direction bring warmth, and so help to ripen whatever the

* Cobbett, *Two Poles*.

"The roofs of churches, cottages, barns, and mansions are always of the local stone that weathers to beautiful shades of green and grey, and prevents the works of man from jarring with the great sweeping hillsides. Then, instead of the familiar grey-brown haystack, one sees in almost every meadow a neatly-built stone house with an upper story. The lower part is generally used as a



FIG. 14.—MAP TO SHOW THE HIGH GROUND OF THE NORTH OF ENGLAND

shelter for cattle, while above it is stored hay or straw. By this system a huge amount of unnecessary carting is avoided, and when roads are few, and generally of exceeding steepness, a saving of this value is a benefit easily understood" *

The Moorland.—We can mount yet higher to an even colder and bleaker world where there are no trees at all,

* *Yorkshire Dales and Fells, G. Howe.*

soil produces. As for the west winds they blow from the ocean and bring warmth in winter and coolness in summer.

Places which receive their winds from the sea are likely to have a climate that does not change so very much from winter to summer, such climates are called *equable*, or *maritime*, or *oceanic*. Places which are far from the sea or receive their winds from the land, have extremes of heat or cold, such climates are called *extreme* or *continental*.

There is no place in the British Isles which is far enough from the sea to have a continental climate, the part that has the greatest extremes (and they are not very great after all) is just this little south eastern corner because it is so near to the continent of Europe.

The difference between the mean temperature of the hottest and coldest months of the year is sometimes called the *annual range of temperature*. In equable climates, the range is small, in continental climates the range is great.

(4) *Sunshine*—Sunshine plays a great part in the ripening of fruit. When the fruit is unripe it is sour on account of the acid it contains. Exactly what happens as the acids are changed into fruit sugar, and the fruit thus sweetened is not very well known, probably oxygen from the air combines with the acids in some way. But whatever the chemical process inside the fruit may be, it is certain that it cannot take place without plenty of sunshine.

Now the sunniest belt of England lies along the south and east coast and includes both the wheat lands and the fruit lands. As a rule the coast regions are sunnier than the inland parts because they are lower lying and the rain bearing winds pass over them without rising. The east is less rainy than the west, there are fewer clouds and more sunshine. The sun is above the horizon in the south east for about 4435 hours each year, and it is estimated that for more than a third of this time there is bright sunshine in the district.

Sheep—The average number of sheep per 100 acres in all England in 1913 was 42. For the Weald counties it

here we are upon the *moor* proper. Around us spreads a great broad brown tableland, with an almost level surface. In the wetter parts there are heather and bogs, but the covering is, in the main, a coarse kind of brown grass amongst which we may see broken lines of bare grey limestone rock.

But the scenery varies in different parts according



FIG. 15—MAP TO SHOW THE VEGETATION OF A PART OF THE PENNINE CHAIN

Identify this area on a map of England. Notice that the parts covered with heath are high.

to the rock. To the north and the south of the moor lands this is limestone, in the centre it is a gritty kind of sandstone called *millstone grit*. Millstone grit country has typical moorland scenery with its abundance of streams and occasional bogs.

We have already referred to the fact that the higher we go the colder it gets. The temperature falls, on the average, at the rate of about 1° F for every 300 feet of

ascent, hence the moors are much colder than the plains below them. Then the moors, being high, catch every wind that blows. They are swept by storms, deluged with rain and, in winter time, often buried in snow that blocks the roads and cuts off each farm from its neighbours. From whatever direction the winds come they bring rain, and hence the moors are not only colder but wetter than the plains below them.

These conditions give rise to the formation of peat; which is found wherever it is too wet or too cold for the vegetation to decay. As a rule, germs, earth worms, slugs and other creatures destroy dead vegetable matter quickly enough to prevent the formation of peat, but in the cold wet upland regions these agents of destruction are either absent or few, hence the thick and widespread peat deposits. Peat is intermediate in character and properties between recent vegetable matter and coal, it is the first stage in the formation of certain kinds of coal. It is formed very slowly and the beds vary in thickness from a few inches to thirty feet or more. Near the surface of a thick deposit peat is a tangled mass of vegetable fibre, lower down the fibrous appearance is lost and the peat becomes more compact. "There is fuel enough in the Pennine peat to last the whole hillside for a thousand years, but there is not a single peat factory on the whole of the Pennine Chain." *

Rivers and their Work.—As soon as the rain falls upon the ground it begins to dissolve some of the solid particles of rock and soil, which therefore disappear, like sugar in tea, and are carried away in the running water. Some of the soft rocks, e.g. limestone, are comparatively easily dissolved. But even very hard rocks, e.g. granite, are unable for ever to resist the action of rain water. And when the rain falls through the air of manufacturing towns, it takes up acids that make its action even more destructive. Sir A. Geikie has calculated that the acid-laden rain of towns would remove,

along the coast between Maryport and Whitehaven, and at Barrow in Furness there are valuable iron deposits. Other minerals of the Lake District include lead, zinc, and copper; there was once a valuable supply of graphite which was used, at Keswick, for the manufacture of lead pencils. The supply is now nearly exhausted, but the industry still persists, the raw material is imported from Ceylon. Here we have another instance of what we have seen in connection with the manufacture of straw hats at Luton. Where an industry is firmly established it tends to remain.

All the highlands contain supplies of stone, including slate and granite in the Lake District, limestone and millstone grit in the Pennines.

We have, then, for the occupations of these upland regions, sheep rearing, mining and quarrying, and of these sheep rearing is far the most important. It is obvious that these people have, with the exception of sheep, little to sell that would find a market in a market town, the result is that there are no market towns on the moorlands and none of any note in the Lake District. But in the Lake District there is a wealth of glorious and varied scenery that attracts thousands of visitors every year. To accommodate these visitors hotels and boarding houses are built; and motor charabancs and buses are required to carry them from one point of beauty to another. So at convenient centres for fishing, motoring, or sight seeing there are little tourist centres and occupations that are comparatively new, connected with the beauty of the mountains.

It perhaps seems strange to say "comparatively new," but it must be remembered that admiration for mountains is something that was unknown to some of our great grandfathers.

Defoe, speaking of a journey he made in the Lake District in the early part of the eighteenth century speaks of "this terrible aspect of the hills," "the frightful mountains," "the horror" "the frightful appearance"

in a century, about one third of an inch from the surface of the marble monuments that stand in the streets

The water also carries small particles in suspension, these settle when the water comes to rest. Furthermore, masses of rock are pushed or rolled along the bed of the stream by the force of the current. The rate of flow affects the power of the stream both to carry small particles in suspension and to shift heavy masses on its bed. 'A velocity of six inches per second will lift fine sand, eight inches will move sand as coarse as linseed, twelve inches will sweep along fine gravel, twenty four inches will roll along rounded pebbles an inch in diameter, and it requires three feet per second at the bottom to sweep along angular stones of the size of an egg'** Hence, the power of water to carry, or to cut away the land by means of the stones and sand it carries, is greatest in time of flood.

The velocity of the stream depends also, not only on the amount of water pouring into it from the hillsides but also on the slope of the bed. Therefore, where the bed is steepest that is, near the source of the river, the amount of suspended matter and the cutting power downwards are greatest, while lower down the valley where the bed is less steep the velocity is less, and when we reach the plains, where the velocity is least, the stream is no longer able to carry much of its former load and must deposit it.

The work done in deepening the bed and widening the valley causes an enormous amount of solid material to be carried to the sea. Thus for instance, the Thames carries away over half a million tons of solid matter every year, while the rivers of England and Wales between them remove not less than 8,000,000 tons. A great part of this settles to the bottom of the sea or lakes and makes them gradually shallower.

So, if we go back in imagination for some thousands of years we may see one of these Pennine rivers beginning

* *Essays of Nature, Antiquity*

of the country, and so on, and in his time and for many years later there was no money to be made by entertaining people who came to feast their eyes and refresh their souls on those "sources of life and happiness far fuller and more beneficent than all the bright fruitfulness of the plain." A man's outlook upon nature has a value to day in the tourist centres of our northern lakes, and also, but to a less extent, in our Yorkshire Dales.

EXERCISES

1 Trace a map of the North of England. Insert as many rivers as you can. Draw the line which separates the rivers flowing to the Ouse from the other rivers. Shade the area enclosed. This is the basin of the Ouse. The line bounding the basin is the watershed between the Ouse and other rivers. Is this land always high? Keep the map for the exercise in Chapter V.

2 Scarborough and Hawes are fairly close together but Hawes is 1130 feet above the sea and Scarborough is only 189 feet above the sea. Draw two graphs of the monthly temperatures (Appendix) on the same piece of paper. What do you notice? What is roughly the difference in temperature each month? What is roughly the difference in height? What is the connection between them?

3 Shake up some clay sand and gravel in a test tube and notice the order in which they settle.

4 Visit the nearest stream.

- i. What is the direction of the flow?
- ii. What is the width of the river?

iii. Which part of the river flows fastest, slowest? To find this out throw in sticks or pieces of grass. What causes the difference in movement?

iv. Work out the rate of flow.

v. Find a good curve in the river. Compare the inner and outer banks for signs of erosion. Compare the rates of flow at the inner and outer banks.

vi. Sketch the part of the river observed.

vii. Compare the height of the water at different times.

as a tiny rivulet, and during the passing of the centuries, by means of the sand and rock it carries or rolls, always scouring deeper and deeper into the high land. At last these rivers of the Pennines have cut out all the dales and valleys that make this northern upland such a place of sheer delight. In one year the work done is too small to be measured, in a hundred thousand years it is so great that men refused for long to believe that it was the work of water at all.

The courses of many rivers can be divided into three parts upper, middle, and lower.

1 *The Upper Course or Torrent Tract* is in the mountain where the river begins. The slope is steep, there are waterfalls and rapids, the dashing waters move both rocks and stones, and the valley grows ever deeper and deeper. The stones get rounder and are worn into smooth pebbles or even ground into sand. The torrent tract is the most picturesque part of the river but the least important to man.

2 *The Middle Course or Valley Tract*—Here the valley is wider, the slope is less steep and the velocity not so great, but, owing to the water supplies brought by the various tributaries on either side, the river contains more water. The widening and deepening of the valley continue but not at so great a rate. The finer sand and mud are still carried onward by the river, but, owing to the slackening of the pace, much of the heaviest part of the load is deposited in this section. Such deposits of river borne soil are called alluvium.

Valleys are often attractive sites for human settlement. They are more protected from the weather than the moorlands above and they are covered with an abundance of fine fertile soil. Communication up and down the valleys is fairly easy, and roads and railways are constructed along them without much difficulty.

3 *The Lowest Course or Plain Tract*—This is where the river is broadest and deepest, but where its banks are lowest, so that in times of heavy rain or spring thaws the

CHAPTER IV

CONTOUR LINES

We have already seen in this book several maps so drawn as to show which parts of the land are high and which are low. But the high land is not all of the same height, a fact that our maps up to now have not disclosed. For instance the map of the Lake District Fig. 17, might lead a thoughtless person to suppose that all the high ground was at the same level, thus is, of course, far from being the case. It is evident that something must be added to or altered in these maps if they are really to give us any idea of the way the land rises and falls.

If we wanted to know who was the taller of two boys in a class we could put them back to back and look. But we cannot carry a mountain from Scotland and put it back to back with one in Ireland, and if the two boys lived one in Liverpool and one in London it would also be impossible to put them back to back. So far as the boys are concerned there is an easy way out of the difficulty. Each could measure his own height with a tape measure and the results could be compared, and by the use of the same tape measure it would be easy to discover who was the fatter of the two. We can also measure the heights of mountains or the distances round them but this is a much more difficult matter than measuring boys with a tape measure and it cannot be done in the same way.

Instead of trying to find the heights of different parts of a moorland suppose we try to find the depths of parts of a big pool. For this purpose we need a boat,

river may rise and flood the adjoining land. When it does this it lays down a thin layer of fertile alluvium and so helps to build land up rather than to destroy it, as in the upper and in sections of the middle parts of the course. The streams that wear out the dales enrich and build the plain of York.

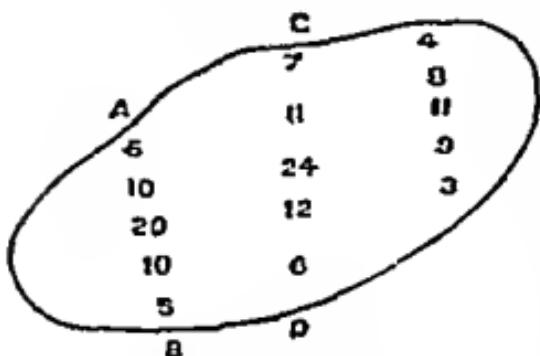
As we have already pointed out, there are few rocks that rain cannot dissolve to some extent, if the rain contains acid its solvent power is increased. Water laden with carbonic acid is particularly destructive of limestone. Hence in the limestone districts there are caves that have been formed by water dissolving away the rock, and underground streams flowing through tunnels similarly formed. These caves were used as homes, in the early days of man's abode upon earth. Here were natural shelters that he could use in place of the houses he had not yet learned to build, and here he left remains which were covered up by dust and soil. It is by digging through the floors of such caverns that much information has been obtained as to the lives of our remote ancestors.

Sometimes a stream will run along over the millstone grit, in an ordinary valley, till it comes to the limestone. At the junction it will often dissolve the rock and work its way down the crack till it has made a deep hole. Then finding a side passage or crack, it will eat its way through the earth in an underground tunnel and come out into the daylight some distance from where it disappeared. The Aire, for instance, begins as a little stream which, after about a mile, flows into a small lake called Malham Tarn. Soon after the Aire has left the lake it reaches the limestone and disappears under the ground. Later on it reappears at the foot of a cliff 300 feet high.

Between the spot where the river disappears and the spot where it reappears again there is, above ground, a *dry valley*. At one time, during heavy rain, the underground stream was unable to carry away all the water and part of it ran along the valley, plunged over the cliff and

THE BRITISH ISLES

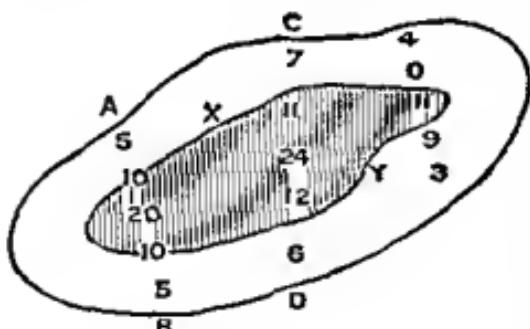
a map of the pool, and a long string weighted with a stone to make it sink. Foot lengths can be marked off on the string by tying pieces of cotton or wool round it. Suppose that Fig 19 is a map of the pool, and that we start at A and row ourselves to B. As soon as we have pulled a few strokes away from the shore we let down the stone and find that the water at this spot is 5 feet deep. We put 5 on the map, at the part where we dropped the stone.



Figures represent Depths in feet

Fig 19.

We go a little further and measure again. This time the bottom of the pond is 10 feet deep and 10 is put on the map at the right place. We go on in this way till we reach B, when we pull across to C and at once begin to row to D, measuring the depths as we go and always putting the depth of the water on the map in figures.



■■ Depths over 10 feet.

Fig 20

When we have finished the little map of the pool will have a number of figures on it. We have not found out the depth of every point in the pond, but if we have taken

a sufficient number of measurements we may be pretty sure that, when a line is drawn round all the figures that are greater than 10, it will be possible to see what

joined the part that had passed through the earth. But the underground stream has now dissolved away so much limestone that the subterranean passage is big enough to carry off all the rain-water that falls.

It would be possible to put a fence round all the land that is drained by any one river and its tributaries. Inside that fence all the water that ran over or through the land into the ocean, would pass finally along one channel. Such an area, the land drained by a river and its tributaries, is called a *river-basin*.

The Gaps.—A region of high land like the Pennine moorlands is a barrier between the people who live on either side of it. In earlier days it was a much more formidable barrier than it is to-day. The man who came

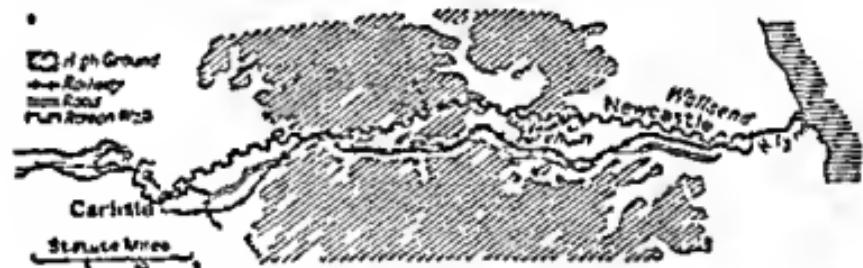


FIG. 16.—TYNE GAP

Notice the line of the wall and the modern road and railway

over from one side to the other was looked upon with suspicion, for there was little reason, in days when there was practically no trade, why any one should ever pass from his native home. Even now there are parts of the moorland that are not easy to cross. But then and now the most important parts of any such mass of high land were not the highest peaks but the lowest passes, the gaps—not the walls as it were but the doors—and the lower the gap the more important it was.

Near to the northern end of the moorland there is a deep and rather wide passage which runs east and west. In it is the river Tyne. It is this river that has cut the passage, and the gap is known as the *Tyne Gap*. The

part of the pond is more than 10 feet deep. This part is shown shaded in Fig 20.

The part which is less than 10 feet deep is left unshaded. All the figures in the shaded part are greater than 10, all the figures in the unshaded part are less than 10. It follows that the point X is *exactly* 10 feet deep, for it lies on the line which divides the part that is less than 10 feet deep from the part which is more than 10 feet deep; in the same way Y must be 10 feet deep, and so also any other point on the line round the shaded area must be 10 feet deep. This line is called a *contour line*, a contour line is a line drawn on a map connecting all places of the same depth (or height). We can also draw the contour line of 20 feet as in Fig 21, and shade all the part which is more than 20 feet deep darker still.

Now lay a piece of paper across the map of the lake as in Fig 22 so that the straight edge lies along HK, and make marks on the paper where the contour lines pass under it; write the numbers 0, 10, 20, etc., beside them. Lift up the paper strip and with it, on another sheet of paper measure off a line of the same length as HK, make marks on this line the same distance apart as the marks on the strip and write the numbers below the line as in Fig 23.

Suppose this line represents the surface of the water. At H the boat was touching the shore. When it had got as far as the place where the depth was 10 feet the string would run out 10 feet, draw a line straight down at this point to represent 10 feet. As the line is really



FIG 21

highest part is not 500 feet above sea-level, and there is thus an easy means of communication, by this route, between the opposite coasts, from Newcastle on the east to Carlisle on the west. In very early times the floor of the gap was, perhaps, swampy and forested and not much used. Men travelled there, as they did in the south east of England, not on the lowest ground, and not on the highest, but on the lowest dry part. So important was the passage that the Romans built a great wall between the two towns mentioned above, and on the north side of it, to protect Britain against attacks from the wild tribes who lived to the north. Portions of the wall still remain to remind us of a history twenty centuries old, while down on the lower ground, on the floor of the gap, there passes a modern road and a branch of the North Eastern Railway from Newcastle to Carlisle, to remind us of some of the progress that those two thousand years have seen.

Further south there is a way from the valley of the Aire on the east, which branches at the west into the valleys of the Ribble and the Lune. The highest part of the Aire Gap is under 500 feet. The gap is used by the Midland Railway which runs to Leeds and then through Bradford and Skipton to Settle on the west. Thence it turns north by means of a rather difficult route which, in one place, climbs to nearly 1200 feet above the sea, before it descends by means of the Eden valley to Carlisle.

Further south still, there are several other quite important routes across the Pennines, but all of these require long tunnels to connect the heads of valleys.

The Lake District.—To the west of the Pennines is another high land, known as the Lake District. There is no gap between it and the Pennines, the two highland masses are connected by a high moorland called Shap Fell. The rain which fell on the western dome shaped mass partly sank in and partly ran away to lower ground, as it does elsewhere. The first directions

a little picture of the string it must be straight because the string would hang straight.

When the boat arrived at the place where it was 20 feet deep, the string would run out 20 feet; and the straight line that represents it must be twice as long as the first one. At the next place marked 20, draw another line of the same length as the last, and at the next point marked 10 draw another line as long as the first. The lower ends of these lines show where the bottom of the pond is. If they be joined by a curved line, as in Fig. 24,

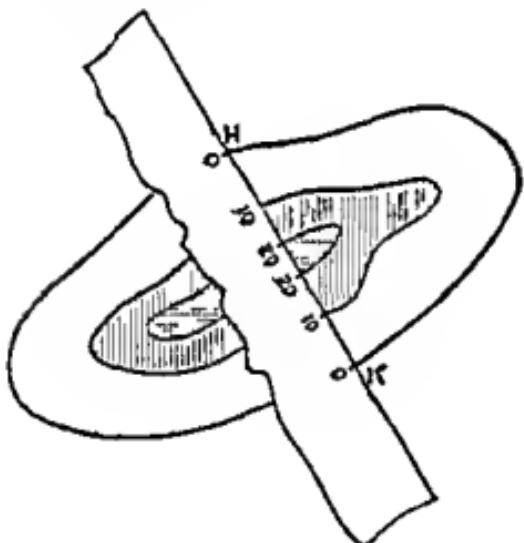


FIG. 22.

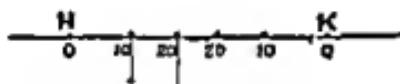


FIG. 23.

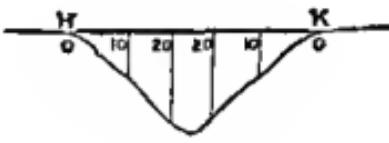


FIG. 24.

this line gives the shape of the bottom of the pond between H and K.

In Figs. 20 and 21 shading, as well as contour lines, has been used to represent depths, but maps are often made without the shading, only with the contour lines. Fig. 25 shows a lake with three contour lines marked. Fig. 26 is a section drawn across PQ in the way already described. If this be compared with Fig. 24 two things will be noticed:—

1. This pond is deeper than the other.

of the streams were settled by little inequalities in the ground; the streams carried away with them any loose material in their paths, formed little channels, and gradually deepened and enlarged them in ways already



FIG. 17.—LAKE DISTRICT
Notice the long, narrow lakes.

explained. "It is as difficult for a river as for a man to get out of a groove."

In a case like this the rivers would tend to run down from the centre in a number of channels radiating from a common centre like the spokes of a wheel, wearing out valleys but leaving certain parts of the high land still

2. This pond is steeper on one side than the other. Whenever the contour lines are close together the slope is steeper than where they are far apart.

Hills can be shown by contour lines in just the same

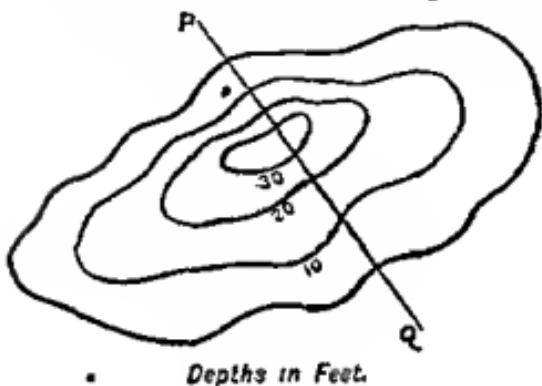


FIG. 23.

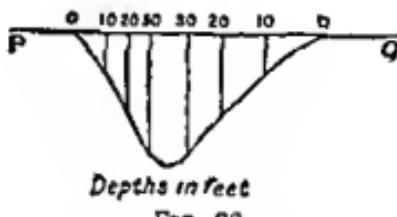


FIG. 24.

way as ponds, though the measurements are not quite so easy. Compare Figs. 23 and 27; they are exactly the same except that under the one is written "Depths

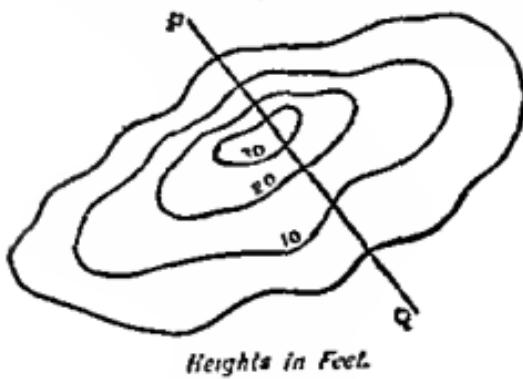


FIG. 25.

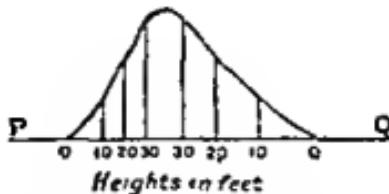


FIG. 26.

in feet," and under the other "Heights in feet," and that the little numbers 10, 20, 30 are written on the other side of the contour lines. Fig. 27, in fact, stands for an island with the sea all round it, not a lake with land

upstanding. The mountains that bound the valleys are thus *residual mountains*, they are the parts that have been left after all these long ages of destruction by rain and ice.

The *Cumbrian Mountains* of the Lake District resemble the Pennine moorlands in so far as they are both high, cold, and treeless at the top but what are called "moors" in the Pennines are known as "fells" in the Lake District. There are, however, certain important differences.

The Pennines contain three series of layers on the top were the coal measures, under these the millstone grit, and under these the mountain limestone. Ice and water have removed parts of the layers and have left us the coal measures on both sides, in the middle the millstone grit still appears but at the two ends only the mountain limestone is left.

The most important rocks of the Lake District are slates and an enormous mass of very old volcanic material, with masses of granite in certain places. In the Pennines the different layers lie almost flat, while in the Lake District they are much more tilted. The tilted harder rocks of this area cause more rugged scenery than is found in the moorlands. The mountains are remarkably steep, rise directly from the lakes and valleys, and give the impression of being higher than they really are.

In each of the radiating valleys there is a stream and a lake; the largest of the latter is Windermere. These lakes are long and narrow, and are mostly the result of the action of the glaciers that buried the land during the Great Ice Age. For the valleys were filled with ice which carried down broken rock and debris from the steep heights above and deposited these across the foot of the valley. When the glaciers had melted, the dammed up valleys were filled by the rain giving rise to a series of beautiful "ribbon lakes".

There are many evidences in the Lake District of the former presence of the ice. These include

1. Rounded hills

all round it. The numbers which tell the height of the contour lines are always written on the higher side. As one crosses the lake it first gets deeper and then shallower, as one crosses the island it first gets higher and then lower. If a section be drawn across Fig. 27 it will differ from Fig. 26 only in that the lines will be drawn upwards to mark heights instead of downwards to mark depths. The result is shown in Fig. 28.

EXERCISES

1. Work out the exercises 1 S in *15 Miles Contour Exercise Book* (I. Urquhart and Young)



Contours at intervals of 200 Feet

FIG. 29—LONGRIDGE FELL, LANCASHIRE

2. Draw small sketch maps of the following and indicate the relief by contour lines for every 100 feet. (a) a conical mountain; the base of

2 Valleys that are U shaped or flattened out at the bottom

3 Heaps of stones which mark the ends of the old glaciers, these are often scratched, the marks being witnesses to the way in which the stones were dragged along in contact with other rocks that cut these lines upon their surfaces

4 On the bottom of the glacier bed the rocks are smoothed but marked with parallel scratches



FIG 18.—ERRATICS FROM CRIFFEL, BUTTERMERE AND SHAP

5 Boulder clay is present, as we have seen it in East Anglia.

6 Rocks are found that once belonged to some district far away, they could have been transported so far from home only upon the surface of a glacier that once extended from the place of their origin to the place where they are deposited hence they are called *erratics*

Most of the lakes are being filled up. The rivers that flow into them carry material from the mountains. In the lakes the water is no longer as turbulent as in the

which is at an altitude of 1000 feet and the top 600 feet higher, (b) a bay surrounded by ground rising to over 500 feet on all sides and containing two islands one rising to 150 feet and the other to 250 feet

3 Fig. 29 shows a map of Longridge Fell in Lancashire. Draw sections along the length of the hill and across it. Take $\frac{1}{2}$ inch to stand for every 200 feet up. What do you notice?

4 At the following distances from the sea the river Tees crosses the contour lines given below. Draw a lengthwise section of the river from its source to the sea. This is called a 'profile'. Distinguish the plain track, the valley track, and the torrent track. There is also in this case a moorland track.

Distances from the sea in miles	{ 33 41 46 51 55 59 62 $\frac{1}{2}$ 65 $\frac{1}{2}$ 67 68 71 73 $\frac{1}{2}$ 78 $\frac{1}{2}$
Height above sea level in feet	{ 100 200 300 400 500 600 700 800 900 1000 1250 1500 1750

rivers, and much of the material is therefore deposited, so that the lakes are gradually becoming shallower, especially near the places where rivers enter.

The Lake District with Shap Fell forms a barrier to communication between England and Scotland, it is so hilly that it possesses very few railways at all. There is one by the Derwent valley from Cockermouth in the west to Keswick, and Penrith in the east. There is another line that creeps round the coast and sends short branches up some of the valleys. The main route, that of the London and North Western Railway to Scotland works round the east side, up by the valleys of the Lune and the Kent, over the high watershed at Shap Fell and then down the Eden valley to Carlisle.

Occupations—The high lands of the north and the north west are too wet and too cold for either fruit or grain, hence the greater number of people who live there must get a living in ways different from those employed in the two districts already described.

In the first place, there is an abundance of short grass suitable for sheep. The eastern side of the Pennines is the drier of the two and it is there that most of the Pennine sheep are reared, the wetter west is less suitable. In the Lake District the hills are so steep that, though this is a wetter district than the Pennines the water runs off very quickly and leaves many of the hillsides comparatively dry. The "fell" sheep are small and hardy and roam freely over the mountains. They know their own fells so well that they rarely wander, even where there are neither walls nor fences to keep them on their proper pastures. They cannot be sold from one farm to another, for they will always try to get home again. Consequently the curious custom exists that when a man rents a farm he rents the sheep with it, the sheep, like the land, belong to the landlord.

At the two ends of the Pennine moorlands in Werdale and in Derbyshire, there are mines of lead ore and here colonies of miners are found. There are coalfields

CHAPTER V

COUNTIES OF THE NORTH OF ENGLAND

THE whole of northern England is not hill and moorland. On either side of the Pennines there are plains suitable for farming and to some of these we must now give our attention.

The Vale of York.—The most important of the northern farm lands is the *Vale of York*, which has the slopes of the Pennines on the west and the steep sides of the *Yorkshire Moors* and the *Yorkshire Wolds* on the east. Much of this district, like the plain of East Anglia, is covered with deposits of boulder clay, the result of the work of the glaciers of the Great Ice Age. These deposits are most noticeable north of the river Aire, further south they are mixed with deposits of soil *alluvium* which have been brought down by the rivers in the way described in the last chapter. In yet other parts of the plain there are gravel, peat and sand.

As there is such a variety of soils a certain variety of products may be looked for. The climate, like that of the rest of eastern England, is rather dry, with warm summers and cold winters so that a fair proportion of the land is devoted to cereals including wheat. The vale is a thriving land of grassy meadows and cornfields with pleasant farmhouses and smiling villages.

The fact that the crops are not alike in all parts of the plain naturally suggests that there will be exchange between the farmers. Moreover, the people on the moorland will wish to exchange their sheep, wool, and other

products for the fruit wheat and other vegetable products that their own less favourable soil and climate will not permit them to grow for themselves. The need for exchange demands places of exchange that is markets.

We have seen that in a hilly country the market towns are placed at or near the gaps where they can most easily be reached by most roads. But in a plain, like that of the Vale of York, travelling is almost as easy in one direction as another yet on the whole it is easier to reach the centre than any other point. Hence the chief market of a small plain will be at or near the centre. The site is not usually exactly in the centre, other matters have to be taken into consideration.

For instance in the Vale of York there is a river the Yorkshire Ouse. This river flows more or less in the centre of the plain and as water roads were in early days of more importance than land roads the market will tend to be situated on this central river. But where?

A visitor to York who sat upon the banks of the Ouse for a few hours would notice that the river did not always flow the same way or remain always at the same level. At one time the river would be flowing towards the sea and falling in height, later on it would be seen flowing from the sea inland and rising in height. These changes in the height and in the direction of the flow of the stream are due to the tides and occur roughly once every six hours. The tides are of great importance to trade for they help to keep the channels clearer of the mud than would be the case if they did not exist and also they save a great deal of labour inasmuch as they can carry ships backwards and forwards without the help of any other force.

The furthest point upstream reached by a tide is a point of great importance and is usually the site of a market town for here the tidal road meets the land roads. So York the market town of the Vale of York, is not exactly in the centre but on the Ouse which is

The chief points to notice are these:—

i. The chalk is fairly soft and is soluble in rain-water; therefore it gets worn away pretty evenly over the whole surface; the slopes are gentle and ascent on foot is easy.

ii. The chalk is porous and absorbs water. absence of water supply means absence of villages. There were few towns or villages, for instance, on the chalk downs of Sussex or Wiltshire. But there were roads, for the hills were drier than the valleys.

iii. The soil on the chalk is usually thin; the only thing that grows well is short grass suitable for sheep.

iv. Where the chalk meets another rock layer that is not porous, the water comes out in springs to provide one of the first necessities of life. Here there could be a settlement, and on the other layer, which is usually clay in the areas we are considering, food could be grown.

The centre of settlement is at the water supply; there is pasturage for sheep upon the uplands, crops on the lower slopes and at the foot, and wood for fuel in the bottoms of the river valleys. The parish, then, tends to be long and narrow and to run from the lowland to the summit of the chalk. The crest of the chalk hills was thus often a boundary between parishes.

East of the Vale of York also we may see parishes of this sort. On the south the Wolds slope gently to the low-lying plain of Holderness, but in the north the slope is pretty steep to the Vale of Pickering. The villages lie in a line along the foot of the chalk and the parishes are long and narrow. Now, the Wolds have the greatest proportion of arable land in Yorkshire, but at the time the parishes were formed they were infertile and suited only for grazing. Here the sheep of the village could find pasture. Down below on the damper ground crops could be grown or cattle fed. The people of each village would wish some of each kind of land, and hence the shape of the parishes.

To the north of the Vale of Pickering the moors are partly of limestone, though it is generally rather sandy.

fairly central, and at the furthest point reached by the tide. In olden days the biggest vessels then known could get as far as York, and even to day small sea-going vessels can get so far inland. The other rivers of the plain are navigable only by much smaller boats.

When the Romans conquered England they chose this meeting point of the river, road, and tide as the site of their northern capital. They stationed a large army at York and, in order to feed it, they made a canal between the Trent and Peterborough, and brought the grain of East Anglia northwards by bort.



FIG. 10.—MAP TO SHOW THE POSITION OF YORK

After the Norman Conquest, a castle was built and strong walls erected. "the ancient gates and bars can still be closed at will; and, best of all, the traveller of to day may walk round nearly the whole circuit of the walls and gaze forth still from the embrasures whence in

old days the warders looked for the smoke of beacons in the north, or watched some jaded rider spurring towards the city from Berwick or Carlisle."

Market, castle, walled-town suggest the next important building, the church, in this case York Minster, "a place of dreams too exquisite to be set down in words . . . a building which is beautiful enough to be the gate of Heaven."

If we compare the land on each side of the Pennines we shall note that, on the east, there is a continuous lowland with only a few hills of no great height. On the west, as we have seen, the lowland is divided in two by the highland of the Lake District, so that it is more

These moors always have been dry and fit for little else but the breeding of sheep. Along the south foot of the hills there is a belt of clay where the water comes to the surface. Here again are the villages and the long narrow parishes.

But in the Vale of York, where the whole of the plain

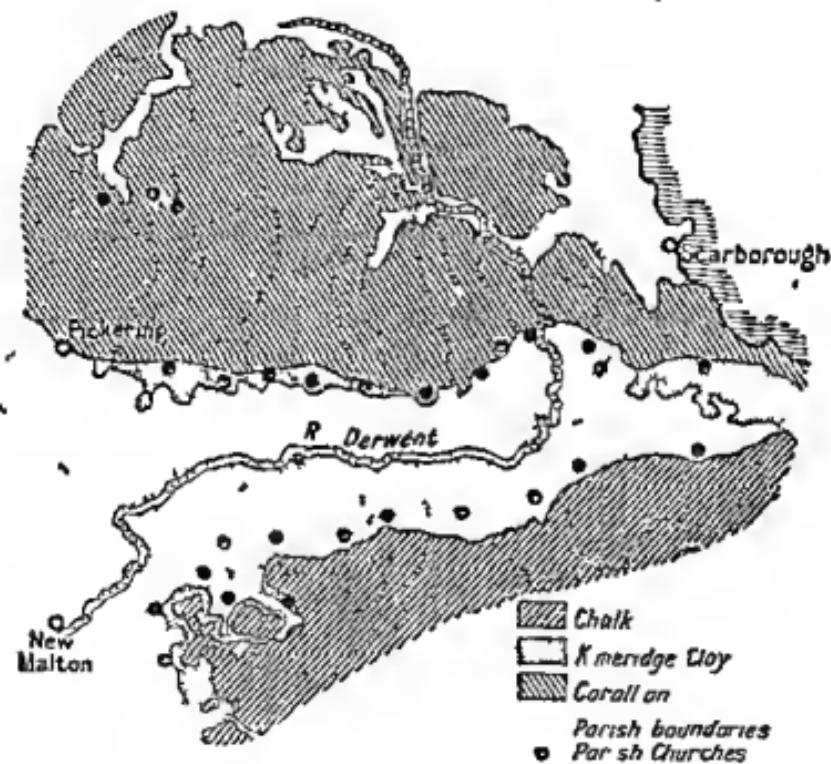


FIG. 35.—PARISHES AND PARISH CHURCHES OF THE VALE OF PICKERING
Notice (1) the shapes and position of the parishes (2) the arrangement of the parish churches

is fertile, the number of towns and villages is large and the parishes are not of this long narrow shape.

The Importance of the East.—The space given to York, the Vale of York, and the chalk areas may seem at first sight, to be out of all proportion to their importance. If we think only of the present the criticism may

difficult to traverse than the lowland on the east. Through the latter there have always gone roads north and south, different forms of the Great North Road. Two of these are of special importance—one of them passes along the foothills of the Pennines, the other goes through York; thus a great deal of the road traffic between England and Scotland passed through this ancient city.

Like so many old Roman forts that guarded road junctions, York now forms an important railway junction. There are lines north to Scotland, south to England, east to the coast and west to the heads of the Pennine valleys or over the high moorlands to the lower lands of the west. The chief railways of the plain are the Midland mentioned in the last chapter, the North Eastern and the Great Northern, these two latter railways unite at Doncaster and together form what is known as the East Coast route to Scotland. They have partly taken the place, so far as swift traffic is concerned, of the old Great North Road.

The Solway Plain—The most northerly and the smallest of the two plains on the west of the Pennines is again divided by the long narrow inlet of the Solway Firth; this plain is sometimes known as the Solway Plain. It is a fertile district but inasmuch as it lies on the west it has a heavy rainfall and is therefore not suitable for wheat or fruit. The moist climate favours the growth of grass and therefore the rearing of cattle.

Roads can reach this plain from many directions. There are three roads from Scotland—one from the east coast through the Tyne Gap, one along the coast from

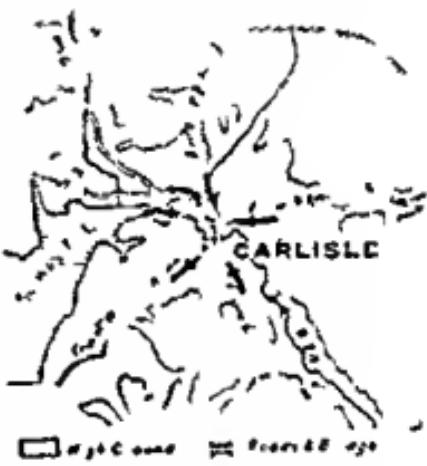


FIG. 31—MAP TO SHOW THE POSITION OF CARLISLE.

have some truth. But originally the east coast was far more important than the west and York was playing a great part in English history when Manchester was a village and Liverpool not thought of.

In far back times it was to the west of Britain Cornwall and Wales and Ireland that seamen from the Mediterranean came⁹ but for two thousand years it is the east and south of Britain that have been important.

The movements of peoples in Britain have been along two main lines first from the Kentish corner to London and thence by a series of lines radiating to various points in the west and second by a series of lines leading inwards from the openings in the east and south east. Along the east were the earliest settlements the richest lands and the best climate for wheat and fruit. The west was moist rocky and away out at the back of thungs. It had to wait a long time before it grew to be of importance in the national life part of the later story in so far as it concerns the north west and certain portions of the north east also will be told in the next chapter.

EXERCISES

I. On a map of England find the following towns York, Leeds, Ripon, Hull, Doncaster, Harrogate, Scarborough. Notice what distances are given for a mile measure how far York is from each of the other towns. Add down the distances and add them together. Find how far Leeds is from each of the other towns and add the distances together. Do the same for Ripon and the other towns mentioned above. Why is York the county town?

9. Compare the map of the Ouse (Exercise 1 Chapter III) with the County of York. Look out the places where they differ. Why should they be somewhat alike? Why should there be differences?

the west, and one from the south which arrives over Shap Fell down the valley of the Eden. Near the meeting point of all these routes is *Carlisle*. It is on a rock for purposes of defence, on the river to take advantage of the water as well as the land routes, and it is at the highest point on that river that could be reached by ships. At the present time, owing to the silting up of the mouth of the river, big vessels cannot reach the city but in the old days all ships were small and so could reach further inland, and ports were also further inland.

Just as York stands on the Great North Road, east of the Pennines, so Carlisle stands on the other great road to the north, the more difficult one, on the west of the Pennines.

Carlisle was an important place in Roman times, and Hadrian's wall that was built to defend the north crossed the Eden on a bridge just beneath the walls. For a time this was one of the most populous parts of Roman Britain. After the Romans departed it retained its importance as a border stronghold for it holds the western gate way from Scotland to England. The Normans built a castle and put a strong garrison into it, a cathedral followed.

The Plain of Lancashire.—Most of this plain was formerly uninhabitable, there were boglands, marshes, peat mosses and forests and, as a consequence, Lancashire was for long one of the least important parts of the British Isles and no north and south way went through it. There was no central market town like that of York in the Yorkshire Plain or Carlisle in the Solway Plain. But when the forests were cut down and the marshes drained it was found that a road could run on the west of the Pennines also, so that there are really two ways to Scotland. This western road is not so easy as the east coast road.

As already remarked it is blocked by the Cumbrian Mountains, and we shall see that even in Scotland it is more difficult than that on the east. These mountains

CHAPTER VI

FACTORY TOWNS OF THE NORTH

a Woollen

Woollen Manufacture.—If we examine the cloth out of which most of our clothes are made we shall find that it consists more or less of wool. From the sheep to the shop is a long story but worth the telling. About the beginning of summer the sheep are *washed*, either by the old fashioned way of driving the animals, one by one, into a stream of running water and cleansing them by hand, or else by means of some kind of sheep washing apparatus. As soon as the coat is well dried, the sheep are *sheared*. For many centuries this was always done by hand with short clippers or shears. Now, however, the immense demand for wool has led to the invention of mechanical cutters which do the work much better and much more rapidly. When the fleece has been removed from the sheep it is rolled up and carefully put away. When the whole of the flock has been sheared the fleeces are packed in bales and sold to a wool merchant or wool stapler, as he is called.

The bales contain good, poor, and medium wool all mixed together and the first thing to be done is to *sort* it out into different qualities. The most valuable is that which grows on the breast, the least valuable is that near the tail. At this stage it is all of it, no matter what the quality, dirty, greasy, and tangled. In order to cleanse it, it is *boiled* with soap, squeezed between rollers to get rid of much of the water, passed to a drying machine

can, however, be crossed by ascending the valley of the Lune and going over the low moorland of Shap Fell.

At one point, near the mouth of the Lune, the high land comes close to the coast and forces the road near to the sea. That road must cross the river by means of a bridge, and the bridge was placed at the highest point reached by the tide; here is the site of Lancaster. Then, too, just as Carlisle is placed at the western end of the Tyne Gap, so Lancaster is placed at one of the western ends of the Aire Gap. A position like this, in the narrow passage through which the road to Scotland had to pass, and also at the end of an important route through the Pennines to the east was too important to be neglected. Even before the road was made it was fortified by the Romans and given a castle by the Normans. Like Carlisle it has lost most of its usefulness as a port owing to the silting up of the river.

Local Government.—

In dealing with the origins of the different towns already described, we have had much to say of roads and bridges. Now roads do not make themselves or bridges build themselves, before such aids to communication can exist, there must be much expenditure of time and money. Somebody has to pay. And as it also costs money to keep these same roads and bridges in repair money must be found, not once, but over and over again, year after year. Obviously the people who get benefit from the roads and bridges should pay for them. The important things are, first that

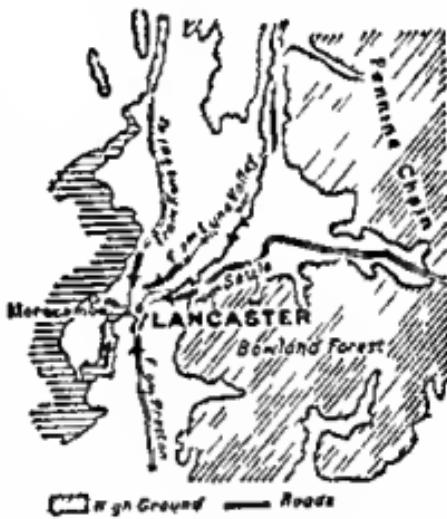


FIG. 32—MAP TO SHOW THE POSITION OF LANCASTER

where it is exposed to blasts of hot or cold air as required, and every particle of moisture is drawn out

By means of another machine the locks are disentangled and a blast of air from a mechanical fan blows out the dust. By this time the wool is hard and brittle, to render it once more flexible and easy to work, it is treated with some vegetable oil such as olive oil. The fibres are now matted together like our hair after washing and drying and it must be combed or *carded* so that the fibres lie side by side, in the same direction, like our hair after it has been combed. This results in a variety of yarn which is too thick and, at the same time, not strong enough for the spinner.

In order to render it suitable for the spinner it goes through various machines, that are too technical to be described here, until finally it reaches the spinning machine and is spun into long threads called yarn. The sheds in which the spinning machines are housed are long and narrow. Thousands of whirling wheels and whizzing spindles fill the air with noise and a sense of uncanny motion. Most of the spinners are girls, they are occupied chiefly in watching the spindles on which the threads are wound and in mending broken threads. As the spindles revolve from five to six thousand times a minute, and each girl has to keep watch over scores of spindles, the work requires nimble fingers and close attention.

The yarn having been prepared is sent to the weavers to be made up as cloth. A piece of cloth consists of one set of long threads the *warp*, which are crossed by another set the *woof*. The process of putting the threads together in this way is *weaving*. In a modern weaving loom, the warp often contains several hundreds of threads. As the cloth is woven it is wound upon one roller, and fresh lengths of warp are unwound from another.

There is much more noise in a weaving shed than there is in a spinning shed. Many of the workers are women, their special business being to watch the flying shuttles as they carry the woof to and fro between the warp and

everybody shall pay his share and secondly that no person shall have to pay twice over. Thus it is necessary to divide the country up into areas and to collect the money required for any area from the people living in it. It was early found that the most convenient place at which to deal with this matter, both the collecting and the spending was the chief market town of any given district, it was the town to which surrounding people could most easily go so it was the town from which they could most easily be reached.

In former times there were three important institutions that looked after local affairs the parish the hundred and the county.

The Parish was the village or hamlet, religion was then a great power in the land and the priest of the village a very important person. The parish was governed by a little court in which sat the 'herdmenn' of the village the priest and six of the villagers. In each village there was also another court the vestry held in the priest's robing room at the church. The village court died out but the vestry remained as the body responsible for managing the affairs of the parish until it was replaced by the Parish Council.

The Hundred was a collection of villages. It had a court which tried cases that were considered beyond the power of the parish to deal with and it gathered the taxes for the district. It is now replaced by Urban and Rural District Councils the one for small towns and the other for country settlements.

The County was the largest and most important of these three ancient institutions. The land was divided up and shared between the chief market towns. These shares were called *shires* or *counties*. A county usually consisted of a number of complete parishes or manors, and some of the curious bends of county boundaries are the result of the necessity of following the boundaries of the parishes. The chief man of the shire was the *shire reeve* or *sheriff*. The shire court looked after the

to mend any threads that may break. The actual work of weaving is done almost entirely by the machine itself, and the work of a modern weaver consists largely in watching the machine and putting in fresh supplies of yarn. On some looms the shuttles are supplied automatically as required, and, by a clever device, the whole apparatus stops as soon as ever a thread breaks.

When the cloth has been woven it is *scoured* to get rid of grease, *stretched* on rails or hooks to be dried, and *burled*, i.e. has all its irregular threads and knots removed. It is *mulled* or *fullled*, i.e. beaten to interlock the fibres and prevent unravelling, *teased* with teazles (the seed vessel of a kind of thistle) to raise the surface and form a nap, *sheared* to cut off the loose fibres and give the cloth a smooth surface, *finished* by removing blemishes and carefully brushing, and *pressed* between polished boards under great pressure.

We have spoken as if all wool were alike and all goods manufactured from it were manufactured in the same way, but this is far from being the truth. Different breeds of sheep produce different varieties of wool and, as already pointed out, the wool in one part of a fleece differs from that in another part of the same fleece. The wool fibres vary in length and in degree of fineness. The fibres from the wool of the Leicestershire sheep are, for instance, much longer than those from the wool of the South Down sheep. As each fibre is called a *staple*, wool is classed as long and short staple. There are other differences that need not now be noted, it is sufficient to point out that "wool" is not one thing but many kinds of things, each of which is used for making a different class of goods.

But all fabrics made from wool are called either woollens or worsteds. Woollen cloths are matted or felted and covered with a nap which usually prevents one seeing the interlocking of the warp and the weft. Worsteds have a finer and more open surface and it is possible to see the separate threads.

The two chief manufacturing processes, spinning and

COUNTIES OF THE NORTH OF ENGLAND 61

welfare of both the village and the hundreds within its boundaries, and the boundaries were largely arranged according to convenience for governing—that is, for collecting taxes and administering the law.

As York was the most convenient place from which to govern the Vale of York, it became the chief town or county town of that division called York-shire, or York's share. In the same way Carlisle became the centre of



FIG. 33.—COUNTIES AND COUNTY TOWNS OF THE NORTH OF ENGLAND

government of the plain round the Solway Firth. Other parts of the north were shared between Newcastle, Durham, Nottingham, Lancaster, Appleby, and Chester. The eight northern counties on the two north roads then were governed from these eight towns.

The counties are not all of the same size; the size depended partly on the ease with which the sheriff and his officers could reach the different parts of the county.

weaving are very much the same to day as they have always been but they are differently carried out. The machine of a modern factory simply does more quickly what the human hand performed some centuries ago, but it does it in substantially the same way. On the other hand, there are now so many kinds of machinery that the workers learn how to use practically only one kind. Thus the two processes of spinning and weaving are performed by entirely different people, in entirely different buildings. In fact, so far has the division of labour been carried that it is not uncommon to find one locality devoted almost entirely to one of the processes. And, further, as there is a very great variety of fabric, and every variety requires special machines the woollen manufacturers generally prefer to make one, or perhaps two, varieties. Similarly the differences in the fibres from different kinds of sheep require special machines for the spinning of each variety, so that sometimes only one kind of yarn is produced in one factory or place.

The Necessaries of Manufacture—But whatever be the kind of wool or yarn used it is evident that the manufacturer will require at least four things *raw wool*, *water* some kind of a *machine*, and *power* with which to drive the machine. Let us take each of these things in order.

1 Raw Wool—This is produced wherever sheep can be reared. For the present it will be sufficient to notice that sheep are reared on the eastern or drier side of the Pennine moorlands. At one time the chief woollen making country in the world was Flanders and sheep were reared in England in order that their wool might be exported. We produced the raw wool others made it into cloth. When the Flemish weavers as the result of religious persecution were driven from their own land many of them settled in England and taught us how to make use of our own wool. To day much more raw wool is used than what is grown at home. Huge supplies reach us annually from Australia, New Zealand, Argentine, and South Africa.

Partly they represent small independent kingdoms which existed after the Saxons and Danes came to England. Several such ancient kingdoms are found in the three regions we have been examining—Kent, Essex (East Saxons), Sussex (South Saxons), Surrey (South Rigi), Norfolk (North Folk), Suffolk (South Folk). The "north folk" and the "south folk" were two tribes of Angles. Though the county of Northumberland is much smaller than the ancient kingdom of Northumberland the name has survived. Here we see that other things besides industries tend to remain.

The division between one county and another was not always a line. Rivers are sometimes boundaries, as the Thames between Berks and Wilts.

The boundary was, quite often, a district, where no one lived and where the exact division between two areas was therefore of great importance. The north boundary of Sussex runs in the high ground which was once forested and unoccupied. The almost deserted Pennine moorland is the boundary between Northumberland and Cumberland, Durham and Westmoreland, Yorkshire and Lancashire.

The boundary line of Yorkshire runs out to the west side of the Pennines. The reason for this is found in the position of the Aire Gap which cuts right through the Pennines and joins the valley of the Ribble. The Aire Gap made it possible to govern part of the west of England from the important centre of York in the east, and, at the time when the division was made, the western side of the Pennines where we now find Lancashire, was but thinly peopled and of little importance.

Nowadays the boundary line may run through an area where there are many people because it has remained where it was fixed so many centuries ago.

Government in early times had a great deal to do with fighting and therefore the old county towns, as we have already seen, were fortified places as well as markets. And they were usually on rivers, and near points on those rivers where an enemy could cross.

2 *Water*—The first uses of water are for waslung and dyeing. Water which has run over chalk or lime stone has dissolved some of that rock and become "hard." It is difficult to get a lather with it; it is therefore wasteful of soap and not suitable for the manufacturer. Now as we have seen (p. 34), the middle part of the Pennines is a kind of sandstone—millstone grit—which does not dissolve in water, so that the streams from this part of the moorland are "soft." This soft water, besides being less wasteful of soap, is also particularly good for dyeing.

3 *Machinery*—The first machines were very simple, their modern successors are highly complicated, and it would take us too far from the subject to point out the differences here.

4 *Power*—(a) The earliest machines were worked by hand in the homes of the people. Making cloth "was a household manufacture, in which every different part of the work was occasionally performed by all the different members of almost every private family, but so as to be their work only when they had nothing else to do, and not to be the principal business from which any of them derived the greater part of their substance" *

(b) So long as the cloth was made by hand at home it could be made anywhere, and the manufacture of woollen cloth was scattered all over the country. But when some one found out how to make falling water turn a wheel and drive a machine, great changes came about. The number of rapid streams and waterfalls was limited; they were not to be found at everybody's door. Then, too, the new wheels and machinery were more expensive than the old, and it was only men with money who could afford to buy them and to build mills and factories in which to keep them.

But once the factories had been built, men and women came to work in them and, as they had to live near their work, small towns grew up round the places where the

* *Wealth of Nations*, Adam Smith.

The County Council and the County Town.—Of old the sheriff was in almost complete control of the affairs of the county, but now the people of each county manage their own affairs, and these people vary considerably in their occupations; they are farmers, miners, tradesmen, doctors, schoolmasters, and so on. Still, whatever their occupation they all need roads and bridges. These roads are used by all the people of the county and not only by those who live along or near to them. Therefore a tax for their upkeep has to be paid by everybody. Further, the rich man has to pay more than the poor, and to get this result, the landowner pays according to the value of the land he owns, the householder according to the amount of his rent.

In order to get the county affairs properly looked after, a certain number of men is chosen from each district to serve on what is called a County Council. This Council has many more duties than the sheriff had of old. It maintains main roads and bridges, makes bye-laws affecting our health, protects fish and wild birds, controls education, grants licences to cinemas and theatres, sees that our food is not adulterated and that tradesmen do not cheat us by using false weights and measures.

To attend to these and many other matters, the whole Council is split up into a number of committees, each concerned with some special duty, e.g. education. The Council needs a home where it can meet to discuss the county affairs and this is usually the County or Shire Hall, and it is, naturally, situated in the county town.

Every county contains some one who breaks the laws. The offenders are usually tried in their own neighbourhood, but if the offences are very serious, murder, for instance, they are dealt with in the county town. Three times a year the judges visit the chief town of the county for the purpose of trying criminals. Hence the county town contains the chief law court, the chief jail, and the office of the Chief Constable, who is head of the County Police.

factories were established. The Yorkshire dales possessed plenty of rapid streams, so many of the factories could be placed conveniently near to the moorlands where the wool was grown.

(c) Then the *steam* engine was invented, and that meant the use of coal. The new steam-driven machinery was even more expensive than that driven by water and the buildings required were much larger. But again,



FIG. 36—COALFIELDS OF THE NORTH OF ENGLAND.

there were only a few men who could build such places, while there were thousands who could work in them for wages.

So it came about that in the latter part of the eighteenth century the woollen trade became definitely settled in Yorkshire, where there were sheep, suitable water, an abundance of coal and a number of people who, for many years, with one kind of machinery or another, had learned how to spin and to weave. Most of the old mills that were

And just because the chief business of the county is done at the county town, this town usually contains the most important markets, the biggest hotels, the finest shops, the cleverest lawyers and doctors, the chief newspapers, and the chief church, the latter being in a number of cases a cathedral.

Parish Boundaries.—The parish or township whose

place it took, is the smallest collection of human beings living together, and it existed in a primitive form long before there were counties, county towns, or market towns. It had its boundaries also, but these were determined chiefly by the necessity of all people to obtain food and water. Especially in the chalk regions the shapes of the parishes are often an interesting illustration of the needs of early man, and of the geography of the districts where he lived.



FIG. 34.—MAP TO SHOW THE CHALK HILLS OF ENGLAND

From Salisbury Plain four lines of chalk hills can be traced—

- i The Chilterns East Anglian Heights, Lincoln Wolds, Yorkshire Wolds
- ii The North Downs through Surrey and Kent
- iii. The South Downs through East Hampshire and Surrey
- iv The Dorset Heights

a long way from coalfields had to be closed, while the factory towns of Yorkshire grew bigger and bigger. The woollen towns are on the edge of the Pennines where the rapid streams pass from the hills to the plains. They are thus near the sheep pastures, the swiftly flowing waters, the coal (which is on the edge of the hills) and they have at the front door, as it were, the level land over which it is easy to bring in the raw material and carry away the cloth.

Factory Towns.—These towns are unlovely places.

Says Emerson, "the fine soot or blacks darken the day, give white sheep the colour of black sheep, discolour the human saliva, contaminate the air, poison many plants and corrode the monuments and buildings"*. The mills are drab and dreary, grimy with smoke, weather beaten and shabby, the houses of the workers dull because they are of stone and stand back to back.



FIG. 3*—MAP TO SHOW THE POSITION OF LEEDS

in long rows of sheer ugliness. The streets are strught and hopelessly regular narrow, and paved with bricks and cobbles, great loaded lorries block up thoroughfares that are not too wide. Dirt, noise, smells—these are some of the features of an industrial town.

Leeds is the largest of the Yorkshire woollen towns. It is situated at the mouth of Airedale and thus, by means of the Aire Gap has an easy through route from east to

* *English Traits* Emerson

west. It is placed on the coalfield, at the edge of the higher land, and gathers together the direct route through the Aire Gap and the other roads that come down the valleys of the Calder and the tributaries of the Aire. At the same time it is on the edge of the plain and is a collecting and distributing centre for the traffic of this part of Yorkshire with the south.

It has, in addition to the woollen trade, manufactures of leather, for which the pastures of the Pennines offer an explanation, and like all large manufacturing centres it makes machinery. The machinery is chiefly that required in the woollen industry and the iron for it comes from the Cleveland district in the north-east of the county.

The second largest town is *Bradford*. This is further in among the hills than *Leeds*.

Amongst the other well known woollen towns are *Wakefield*, *Halifax*, and *Huddersfield*. As noted earlier in this chapter, each town usually has some special branch of the woollen industry which is specially characteristic. Thus more ready made clothes are manufactured in *Leeds* than in any other town in Britain. More mohair is woven in *Bradford* than in any other place in the world, and *Halifax* has the largest carpet factories in the world. Amongst other specialties are dyeing and worsted suitings at *Huddersfield* and heavy woollens at *Dewsbury*.

b. Cotton

Cotton cloth is made from cotton yarn and cotton yarn from cotton fibres which are obtained from a plant. The cotton plant produces a pod in which are a number of seeds surrounded by a mass of white soft fluffy stuff that is the raw cotton. The seeds are removed and the down is packed into big parcels called bales and sent to the places where it is required.

From the docks or railway stations the bales go to the mills where the cotton is sorted into long staple (1 inch

more regulated and more comfortable; they are not exposed to the drenching rain and biting winter cold. The others work not when they wish, but when nature dictates. But for that very reason the modern town-dweller loses something. It is not only that he has exchanged the green of the field and the blue of the ocean for the drab dreariness of the warehouse or factory, and that overcrowding matters more. He has come to think that all life everywhere is ordered and easy, to think that money is the basis of life, to count on being able to obtain all he wants at the shop round the corner, and generally to be out of touch with nature. This is a big price to pay.

EXERCISES

1 Draw graphs on the same sheet of paper to show the growth of each of the three cities mentioned. What do you notice?

	York.	Liverpool	Manchester (and Salford)
1086	2,000	100?	—
1350	10,500	1,000	—
1505	—	700	—
1600	—	2,000	10,000
1700	—	5,000	—
1750	—	18,000	—
1757	—	—	10,639
1760	—	25,000	—
1783	—	—	39,000
1801	16,145	77,653	59,752
1831	43,095	295,000	164,378
1851	36,302	258,236	367,232
1901	77,793	711,276	764,925
1911	82,252	746,566	945,817
1921	84,052	753,343	964,741

2 At six points from SW to NE across Manchester the following number of tons of deposit of soot, etc., per sq. mile from the atmosphere were measured per month. What conclusions might you draw?

	A	B	C	D	E	F	
S.W.	42	52	51	56	86	62	N.E.

3 Copy the high ground (Fig. 14) in pencil and put in the coalfields (Fig. 36) in ink. How would you describe the situations of the coalfields?

to $1\frac{1}{2}$ inches) and short staple ($\frac{1}{2}$ inch to inch). Afterwards all the different kinds of long or short staple as the case may be are mixed on the floor of a room, the object of mixing is to get a kind of average quality. When the cotton is required in the mill, a man with a rake draws a quantity out, downwards from top to bottom of the pile, and so blends the cotton again.

At this stage the fibres are matted together, they are now put in a *willosing* machine, where by means of rapidly revolving rollers with spikes the tangled mass is violently tossed and shaken and pushed gradually forward to the far end of the machine, loose, and free from dust and dirt.

The fibres are now loose but still tangled. They are next put into another machine and the cotton is rolled into layers that look something like a sheet of wadding. This is beaten into another layer of more regular quality and thickness which is *carded* or combed. The fibres are laid parallel to each other and delivered as a thin film which is drawn into a continuous ribbon like piece called a *sliver*. The sliver is round, thick, soft, untwisted and delicate and must be made thinner and stronger before it can be handed to the weaver.

The first method of *spinning* fibre into a thread was to place some of the carded fibre on a forked stick called a *distaff*. This was held under the left arm and a small portion was twisted into thread by a weight called the *spindle* which was given a sudden twirl between the thumb and forefinger of the right hand. The thread was held by the thumb and forefinger of the left hand and as the spindle twisted the thread more fibre was supplied. As the thread was spun it was wound on the spindle. With the use of the spinning wheel fibres were spun much more quickly but even this method was slow, for only one thread could be woven at a time.

In 1761 Hargreaves invented the spinning jenny which was really a number of spinning wheels so arranged that they could be worked by one man. Hargreaves was

CHAPTER VII

PORTS

Importance of Ships.—The British Isles do not and could not produce anything like enough food for the British people or anything like enough raw materials for the British factories. There is not in these islands enough leather for our boots, not enough iron ore for our engineering works, and not enough wheat for our bread. And as we are an island these things that come from abroad—our *imports*—must come to us in ships.

A great part of the time of our workpeople is spent in making things to sell to other countries in exchange for the things we use but cannot produce. Thus three-fifths of the working time of our engineers, more than half the time of our woollen workers, and three-fourths of the time of our cotton operatives are spent in producing things for customers over the seas. All the cotton goods used in the British Isles, for instance, could be made by working on Mondays only; if there were no foreign trade, the mills would be idle the rest of the week. And all the things we send to these foreign markets—our *exports*—must be sent in ships.

Roads, railways, and canals go to the sea, and without the ships they meet there the factories would be idle and the people would starve.

Situation of Ports.—Ships need places of shelter where they can receive or discharge their cargoes in safety, where they can lie at peace and escape the fury of storms. Such havens of refuge are harbours, they are either

followed by Arkwright who invented a machine for spinning by rollers and then Compton combined the two inventions in the spinning mule which, with many improvements is in use at the present time. The modern spinning mule may contain as many as 2000 spindles, all working under the control of a single person.

The quality of fineness of the yarn is described by means of figures called "counts"—forties," "fifties," "sixties" and so on. The smaller the number the coarser the yarn, for "forties" means forty hanks to the pound, while "eighties" means eighty hanks to the pound. The best spinning machines can spin a cotton so fine that it takes 350 hanks to weigh a pound.

From the spinner the cotton yarn goes to the weaver, where we get another succession of processes—*winding* when the yarn is transferred to reels or bobbins, *warping* the preparation of the long parallel threads of the warp, *sizing* dipping the yarn in a mixture of starch and water to strengthen the threads, *beamimg* laying the warp upon the loom to give the desired breadth of cloth, *draxing* in each individual thread of the warp is passed through a loop in a set of strings fastened at top and bottom to thin bars of wood, *weaving* the interlocking of the threads of the warp and the woof.

When the cloth leaves the weaver's loom it must be *bleached* to render it perfectly white. It is singed by being drawn through gas jets so that the nap is burned off and the surface left even and smooth, burning is prevented by the rapidity with which the cloth is passed through the flames. It is steeped in cold water boiled in milk of lime, washed again, steeped in acid washed again, boiled in soda, soaked in bleaching solution washed again, straightened mingled dried damped once more pressed, packed in bundles and sent to a shop to be sold. And the whole business so wonderful are the mechanical arrangements takes only two or three days.

The immensity of the cotton industry is shown by the following figures. It is estimated that 500,000,000 of

natural or artificial. The natural harbours are estuaries or bays that are more or less enclosed by land. But land locked bays with deep smooth water are hard to find, and there are few good harbours that have not had to be improved by man.

Artificial harbours have walls, piers, and breakwaters so built as to enclose a sheet of water and protect it from the force of the wind and waves outside. In most of these works the larger part of the structure is buried, millions of money are sunk beneath the sea every year in their construction. The breakwater at Fishguard swallowed up one and a quarter million tons of material. Such artificial protection is so expensive that there are few harbours that are entirely artificial.

For a place to be considered a good harbour it should have shelter from strong winds and stormy seas, good holding for anchors and an entrance through which vessels can easily pass. If the entrance be too wide, the heavy seas can sweep in, giving rise to greater danger inside than outside the breakwater.

At different points upon our coasts chiefly at river mouths, there are many places where small boats, at any rate, can come close to the shore to take up or discharge either cargo or passengers, and in many cases there are small towns or ports at such spots.

In what kind of situations do we find ports?

In the first place, there must be a number of people not too far from the point where the ships arrive and depart. These people will purchase the things that are brought and provide the things that are taken away. This means that the position must have a good *hinder land*. "The hinder-land of a seaport may be defined as the land behind a seaport which supplies the bulk of the exports, and receives for distribution the bulk of the imports. In general, the importance of a seaport is in direct proportion to the extent and productiveness of its hinder land" *

* Chisholm, *Scottish Geographical Magazine*, vol. xxx.

the human race are completely clothed 750 000 000 are partially clothed and 250 000 000 are not clothed at all, and of all the garments worn by mankind 90 per cent are made of cotton. We do not know how many of the earth's population are wholly or partially clothed in cotton which has been made in Lancashire but as this country contains 40 per cent of all the spinning spindles of the world it has been estimated that the number must be about 500 000 000.

The fact that such a gigantic industry should be settled largely in one district calls for explanation. In the beginning South Lancashire, with its port of Liverpool opening to the Atlantic was perhaps the most convenient place for receiving the raw cotton from America. Even more important was the fact that there was also a small population, accustomed to weaving in the South Lancashire Plain. At first the cotton was sent to adulterate other materials, it was some time before cotton was woven entirely pure.

As in the case of wool questions of raw material, machines and power are important. But in the case of cotton there is something else to be taken into consideration. In order to spin very fine cotton threads the air must be damp. If it be dry the threads snap when tightly stretched. Hence the cotton industry could only be successfully carried on in a district with damp air. Lancashire has just that humid atmosphere.

At first cotton was spun and woven by hand in the houses, then it was spun and woven by water driven machinery and the factories were placed at the entrances to the valleys where they had swift water for power behind them and level land for traffic in front of them. Round these factories people assembled to live and work and the cotton towns came into being forming a circle on the south western edge of the Pennines. When steam driven machinery was invented there was plenty of coal on the South Lancashire coalfield so that there was no necessity to move the mills.

Secondly, a horse can draw on the average one and a half tons on a road, on a canal he can pull forty tons with comparative ease. This shows that things can be moved more easily and so more cheaply on water than on land. The speed is slower, but in many cases cheapness is of much more importance than speed. Therefore it is advantageous to get a vessel as far as possible into the country to which goods are taken. The shorter the land journey that has to be made by the goods before they are delivered the cheaper the cost of carriage and therefore the cheaper the goods. Hence ports are *as far inland as possible*.

In the situation of ports round the coast of the British Isles the thing that has mattered most has been the tide, which causes currents to flow back and forward in the estuary of each river. These currents carried the vessels up or down the rivers even the steam vessel does not need so much steam that is it does not need to burn so much coal when it has the assistance of the tide on its journey and when all vessels had sails the tide carried vessels round curves which might have been impossible when the wind was blowing in certain directions. We are fortunate in this country in having very high tides that are thus of great commercial importance.

Tides are not always an advantage. If the mouth of the river is funnel shaped and if the river itself flows very swiftly then when the tide runs in quickly the in flowing water is lifted to a considerable height and we get a *bore* or wave some feet in height marking the front of the rising water. The Thames has a funnel shaped mouth but the river itself is slow hence there is no bore on the Thames. In the case of the Severn both conditions are present and the tide rises as much as fifty feet at Chepstow so the bore is often seen. Other British waters where a bore or *cagre* is seen are the Solway Firth and the mouth of the Trent. At tides of high spring tides the bore at the mouth of the Trent is very distinct the water rises at the mouth to a height of six or eight feet above the

The cotton towns are just as ugly and dirty as the woollen towns and in addition, as they lie on the wet side of Britain they get much more rain and are therefore, if possible, even more unpleasant. Flemish settlers introduced into this district the iron shod wooden clogs which they wore on the continent. The clogs were particularly serviceable in keeping out the wet and they are worn to this day. Visitors to a cotton town are often awokened



FIG. 38.—THE FACTORY TOWNS.

early in the morning by the clatter of the clogs on the stone sets of the streets. Shawls over the head and clogs on the feet are the typical dress of the female operatives of Lancashire.

There has been in the cotton industry as in the woollen industry great division of labour. The different kinds of cotton are not the same thing and machines that deal with short staple are not suitable for dealing with long staple. Spinning coarse counts is the work of the people

ordinary surface, and rolls up the river in a huge mass which causes no little disturbance to the small craft that it meets in its course

But such disturbances are practically not of much account. And the tide does even more important work for man besides carrying for nothing. Imagine that the tide is out, the river water will flow as far as A and there meet the tide just beginning to come in. There is "dead water" at A, that is, the water appears to be still, moving neither in nor out. A little later when the tide has gained force the dead water is at B then at C, and so on. By the time there is a dead water at C there is a strong current at A and this strong current passes each point in turn as the force and height of the tide increase. Later on, the movements are reversed.

The water is continually moving first one way and then another, and the mud that is suspended in it is not

allowed to settle to the bottom. Thus the tides tend to keep the passage open, they "scour" the estuary.

Inasmuch as the tide keeps the channel clear and carries ships free of cost, men seek to use it as far and as much as possible, so that the old ports of Britain are situated, as in the case of Canterbury, York, Norwich, Lancaster, Carlisle etc., at the furthest point reached by the tide and nearly every little river had its little port.

Now just as a few little market towns have grown into great cities so a few of the little old ports have grown enormously. The change has taken place because of the cheapness obtained by doing things on a large scale. Enormous vessels have taken the place of little boats and it has been found to pay to have one or two places fitted up with all conveniences continuously used for handling



FIG. 41

of *Oldham*, fine and medium counts of those of *Bolton*. Then *Blackburn* specialises in weaving and *Bolton* in bleaching. The necessary cotton machinery is made largely at *Manchester* and *Oldham*, and the dyes and chemicals at *Widnes* and *St Helens*.

The greater part of our raw cotton came from America and was imported at *Liverpool*. From this port it had to be sent to the circle of towns on the edges of the moorlands, when the cotton had been manufactured it had to go back from these towns to the port to be sent abroad. It is evident that if some central spot could be found it might act as a distributing and collecting centre for the towns in the circle. There is such a spot and there stands *Manchester*.

Manchester is the natural centre of all the roads which cross the Pennine moorlands to reach the south east of Lancashire, as well as of others that come across detached parts of those moorlands. One road runs north west to *Bolton* and is there divided so that one branch goes round the moorland to *Preston* and the other follows a valley to *Blackburn*. A more northerly road reaches *Bury* and *Accrington*, another runs to *Rochdale* and over the hills to *Halifax*. Another runs north east to *Oldham*, and there divides, one section makes a short sharp ascent and passes over to *Huddersfield*, while the other, with gentler incline and more windings, follows nearly the route of an old Roman road to *York*.

Travelling eastwards from *Manchester* there is a way which forks to send branches to *Sheffield* and *Barnsley*, and, finally, there are roads south east leading into *Derbyshire*.

The exact position of the site was probably determined by a 'hard rock of stone' (Leland) on the banks of the *Irwell* a good foundation for a fort. But there was very little choice to the east were the moorlands, and immediately to the west there was a great stretch of marsh. Just at the site of *Manchester* there was the possibility of passing between them where the river could be crossed.

cargo, rather than having many badly provided with appliances used only now and then. Such great ports are not at the highest point reached by the tide, but only as far inland as great vessels can reach. The old ports had quays and warehouses; the large ports have much more extensive accommodation for ships and cargo.

As an immense amount of produce is collected and distributed from a great port, there must be enormous *warehouses*, where the goods can be stored. These are often devoted to one article, as wool, wine, grain, etc. Near to the warehouses are the meeting places where the people gather who deal in the things which the warehouses contain. That is, near every group of special warehouses there are special markets or exchanges. Wherever there is a world wide commerce, warehouses are a necessity.

The warehouses usually line the quays, or places where the cargoes are landed. If there is deep water right up to the shore the vessels come close alongside, otherwise, piers are built out far enough to allow of the cargoes being discharged in deep water.

A prominent building at every port is the *Customs House*. Certain commodities, like tea, tobacco, spirits, etc., are not allowed to be imported into this country without the payment of a tax to the Government. At every port there are customs officers whose business it is to collect these taxes. As soon as a vessel enters a port the customs officer is supplied with details as to the kinds and quantities of the things the ship has brought. The customs authorities publish a daily list of vessels arriving and departing and health officers also make strict inquiries as to the health of persons who wish to land, in order that no one suffering from an infectious disease may be allowed to enter the country.

For the convenience of the ships every port is provided with docks, where they may be unloaded in still water and repaired if necessary. Where the tide does not rise or fall very much, as in the Mediterranean, there are no

Chester is the Latin for camp and its presence in the name of any place either in this form or as *caester*, *caster* or *cer* indicates the ancient site of a Roman Camp. A situation such as this was important in Roman times and bound to be a centre of trade as soon as ever there were people in the valleys to which the roads led but for reasons already explained Lancashire was for long, long years



FIG. 39—THE CENTRE OF MANCHESTER.

Notice that Market Place is close beside the church now a cathedral, and the bridge. Find other names that are traces of old times.

a thinly peopled country, and Manchester therefore a small town. Traces of its existence as a small market town can be seen on examining Fig. 39. In 1773-74 the two towns of Manchester and Salford had only 27,000 people. In 1789 the first cotton mill worked by steam was built in Manchester and twelve years later the population had increased to 84,000. In 1921 the two towns had a population of nearly a million.

doors, but when the range of the tide is great doors are necessary. As the tide rises the ships press into the *wet dock*; when it is at its height the gates are closed. When the tide in the river falls, the water in the docks is held up and the ships remain stationary by the side of the quay. The disadvantage of these conditions is that vessels can enter or leave only during the time the gates are open, usually for about two hours.

Then there are the *dry docks* used for the repair of vessels. These are fitted with a row of keel blocks up the centre. When the water has risen high enough the vessel enters and the gates are shut. The water is then pumped out, the vessel settles down on the keel-blocks and is supported by huge pieces of timber that rest on the sides of the dock. The sides of these docks are built in terraces or steps and shaped something like the shape of the vessel. This makes it an easy matter for the workmen to get at all parts of the exterior for painting and repairs.

The enormous manufacturing areas of the north of England are exactly those which will require the services of ships, docks, warehouses and quays; therefore we should expect to find them as well provided with ports as possible.

Ports of the North of England.—The Yorkshire coal-field produces large quantities of woollen cloth for export and imports large quantities of raw wool. It has other industries, of course, but the woollen industry is the most important. The nearest estuary to this coal-field is the Humber, and here there are the usual high tides of Britain to help. The mouth of the estuary is sheltered, by the low piece of land which ends in Spurn Head, from the violence of the north easterly gales. The shores are flat, so that there is easy communication with the big towns of Yorkshire and by means of the Aire Gap, with those of Lancashire also. Obviously there ought to be a port connected with the Humber estuary, and, for reasons explained, it ought to be as far inland as possible.

But Manchester is not mainly a cotton manufacturing city. The spinning jenny and the mule were both chiefly employed in country districts, and it is in those districts that the actual yarn and cloth are made. Manchester is the business centre, the place where cotton and cotton goods are bought and sold. It is of course a great railway and canal junction as well as a market, and naturally machinery is made for the use of the busy people in the towns by which it is surrounded.

Iron Manufacture.—Iron manufacture is as complicated a business as the manufacture of wool or cotton. The first process is the obtaining of iron from its ores. Iron ores, like other ores, when taken from the ground are mixtures of metal and other substances. To get the metal from the ore the latter is mixed with coal and limestone and heated in a blast furnace, where the metal melts and is run off. This is called *smelting*. This process requires a great expenditure of fuel and is most profitable where coal is plentiful and cheap.

Iron ore used to be found near many coalfields in Britain, but in nearly all of them it is now worked out and iron ore has to be imported from elsewhere in Britain or other lands. In some few places it has paid to take coal to the ore where the distance is not great. There are, however, some countries, like Spain or Sweden, that have plenty of iron or copper ore but no coal. Their ores are therefore sent to other lands to be smelted.

Where the iron is extracted from its ore it is usually more profitable to continue the manufacture of iron or steel goods. These again require the use of a greater or less amount of coal and so tend to be on the coalfields also.

As we have seen, many of the cotton or woollen towns have iron manufacturing as a subsidiary industry, and it was interesting to discuss the advantages which enabled people in the old city of Lincoln to build up an important iron industry. But there is one city and one district which are specially associated with the manufacture of steel, viz. *Sheffield* and the district round it that

In old days, it was at York. Nowdays big steamers must stop soon after they enter the estuary, and where they stop is Hull.

A vast amount of alluvial mud is carried into the Humber by the Ouse and the Trent, and if it were not for the steam dredgers, the docks at Hull would soon be useless.

As Hull is conveniently situated for trade with the north part of Europe, vessels come to Hull from Russia, Germany, Sweden, Norway, Denmark and Holland loaded chiefly with timber, hemp, flax and grain.

The Lancashire cotton area also requires a port. The nearest and biggest estuaries are those of the Mersey and the Dee. The estuary of the Dee has been more or less silted up and the Mersey is the only inlet and outlet for the trade of this part of the kingdom. It owes its superiority over the Dee to the fact that it has a bottle shaped entrance.

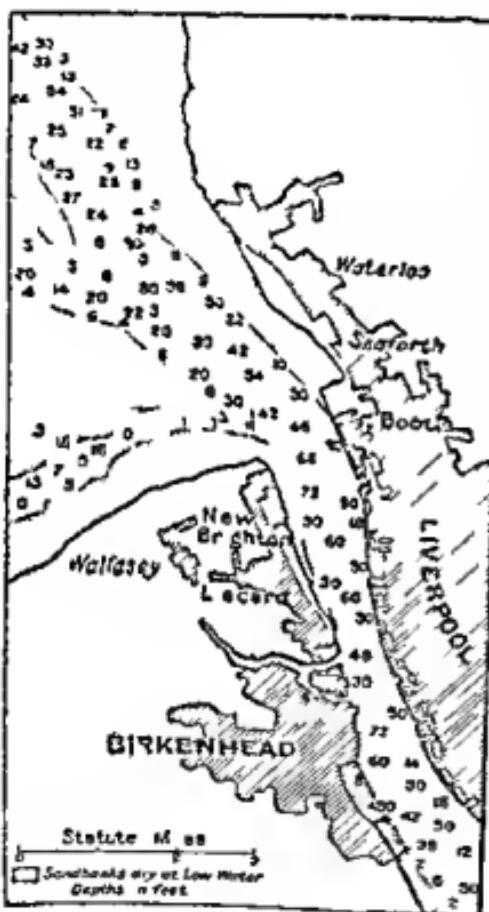


FIG. 42.—THE BOTTLE NECK OF LIVERPOOL.

This always ensures a head of water inside or outside and a rapid current through the 'bottle neck'. The current sweeps away much of the debris brought by the river, but dredging is, nevertheless, always being carried on. A "bar" of sand is formed where the

used to be called Hallamshire. This is not exactly a new thing. Macaulay says "Iron abounded there, and from a very early period the rude whistles fabricated there had been sold all over the kingdom. They had indeed been mentioned by Chaucer in one of his Canterbury Tales."

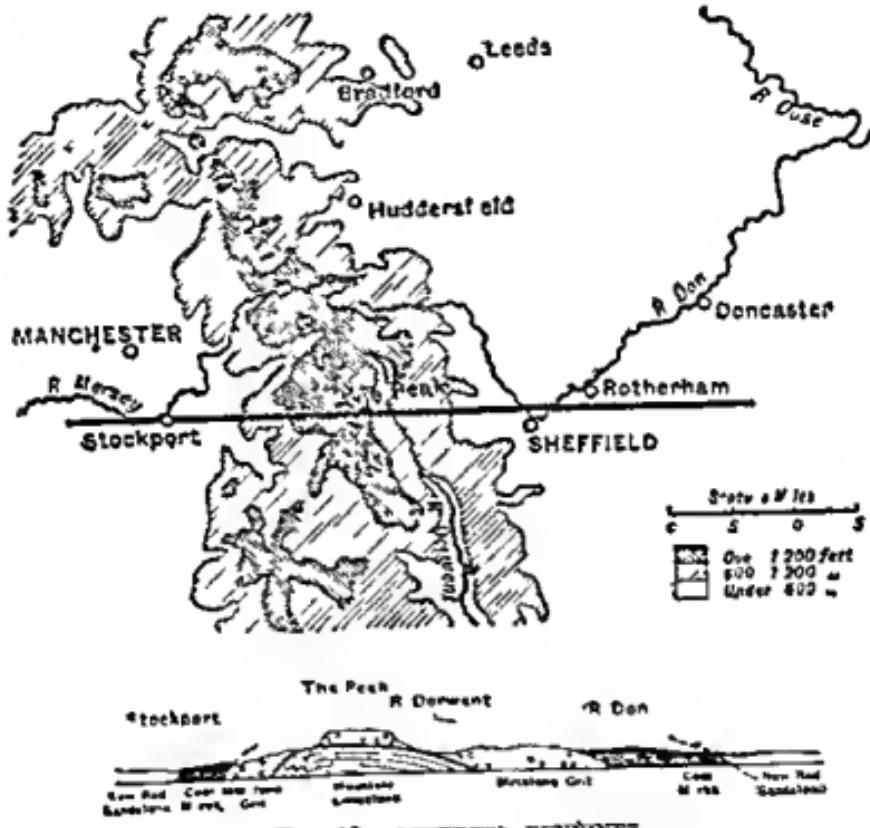


FIG. 40.—SOUTHERN PENNINES.

A section has been drawn to show not only the relief but the kind of rock. Notice that the millstone grit occurs just beside Sheffield.

Most of the Hallamshire forges were collected in a market town near the castle of the proprietor." Iron used to be manufactured in areas where there was a good deal of wood for making charcoal, and where there were strong winds to give a draught to the fire. Later, water power was used to work the bellows.

currents slacken in most rivers, and the Mersey is no exception. Dredgers are of different kinds, but whatever their form, they usually discharge their loads of mud and sand into barges or other vessels, and when these latter are full they are taken out to deep water, where they deposit the rubbish upon the bottom of the sea.

The Mersey estuary is sheltered from all winds except the north-west. It is in one corner of the Irish Sea and from it the sea ways lead to other parts of England, to Scotland and Ireland, and straight out across the Atlantic to America.

In the immediate hinterland are coalfields, factories, and several millions of people, hence there is always plenty of trade. The shores are flat, so that roads, railways, and canals are easily constructed to link the estuary with other parts of the country. Especially is the "Midland Gate" between the Pennines and the Welsh Hills important. There is a sense in which it is true to say that the whole of Britain is the hinterland for the Mersey estuary. At the bottle neck in the estuary is the port of Lancashire—*Liverpool*.

Less than two centuries ago, when most of our trade was with Europe, Liverpool was of little importance. Our wealth lay in the lands of the east, there were few people indeed in the north west. But the growth of the cotton industry and the growth of our trade with America resulted in the conversion of a village into a port, second only to the Port of London.

The first dock was built two hundred years ago; to-day there are nine miles of docks, and forty miles of quays. Dredgers are always at work deepening the channel and the dock, warehouse and railway accommodation is the best in the world.

On the opposite side of the estuary, round the wide deep mouth of a small stream, the Birket, engineering and ship-building works have been erected. There is a constant ferry service, day and night, between the two banks of the Mersey, and there is a tunnel under the river.

Under these conditions the Weald district had advantages which it does not now possess. Sheffield however which was in a district where there was iron and wood continues to be the centre of its old trade and of many newer ones. Cutlery is still made from ores brought from Sweden and Spain. Near by are supplies of limestone for smelting garnister for lining furnaces as well as the particular kind of millstone grit which is used for grinding stones. But it is not only cutting tools of all kinds that are made. The people of Sheffield have learned to make almost anything that can be made out of iron and specially of the best steel. "Sheffield make" is a guarantee the world over for good engineering worksmanship.

But towns where ores are smelted are even smokier than other manufacturing towns. It is not only from tall mill chimneys that smoke and other products of combustion pour out. The blast furnaces which at night light up the sky for miles with their glare and other furnaces used for treating the iron and steel at various stages of manufacture each contribute an amount of impurity to the atmosphere so that near such places some vegetation has a hard struggle for existence.

Villages and Market Towns —The little old market towns and villages that we saw in Chapters I and II, sleepy, quiet and picturesque with manners and courtesies of ancient days still clinging to them present a striking contrast to the new, dirty, noisy factory towns crowded with people. Yet as in the case of Manchester whose name betrays a Roman origin most of the modern factory towns are merely old towns that have grown in wealth and size.

In some ways it may seem that the workers in factories are better off than the inhabitants of the old villages or even than the modern farmers and fishermen. They have more regular hours, they know at what hour they begin work and at what hour they cease and exactly what time is allowed for meals. They are engaged at the same kind of work from January to December. Their lives are

by means of which a railway connects Liverpool and Birkenhead

Though Liverpool is mainly concerned with cotton it has many other interests as well. It is the headquarters of a number of trans Atlantic steamship lines, it imports foodstuffs for the dense population of the hinterland and it exports large quantities of iron and steel.

Liverpool was always the port at which the cotton entered, there is, however, as we have seen, a big cotton market at Manchester. Unfortunately, Manchester had no estuary and no tides. Therefore the cotton had to be unloaded at Liverpool and sent by rail to Manchester. Now rail transport is expensive, and to save the cost of the land journey a canal was cut to connect Manchester, not with Liverpool, but with the world.



FIG. 43.—THE HINTERLANDS OF THE NORTHERN PORTS (after Chisholm)

same time, wider than the Suez Canal. The Manchester Ship Canal is 'essentially the lower portion of the rivers Irwell and Mersey, straightened, deepened, widened and controlled. One obvious reason for adopting as far as possible, the actual course of the existing streams lay in the great difficulty and cost of obtaining any other route through so densely populated a district as that which had to be traversed'** Bridges had to be constructed to carry roads and railways that already crossed the route of the canal, and a tunnel had

The foul shallow Irwell, on which Manchester stands, has been replaced by a splendid waterway as deep as, and, at the

* 'The Oldham Geographical Journal' 1894

to be dug underneath for the use of the aqueduct that brings Liverpool's water supply from Wales. The old Bridgewater Canal is carried over by a swing bridge, "which is pivoted on an island in the centre of the new canal. When a ship has to pass, water tight gates are closed at each end of the bridge, and a complete section of the canal swings round and back again without a drop of water being lost" *

Fifty one million cubie yards of soil and rock were excavated, and when the work was in full swing, over 16,000 men and boys and 100 steam excavators were employed, while the consumption of coal was 10,000 tons a month.

By means of the canal, Manchester has become a port. As most of the imported raw cotton is consumed near Manchester it would be thought that most of it would now be unloaded there. That is not the fact. Liverpool has still a great trade in cotton, just because it has always had a great trade in cotton. People were in the habit of buying there, and it is difficult to change habits. Warehouses, clerks, business men and banks that handled the cotton trade could not be moved at a minute's notice, but the import of cotton to Manchester is steadily increasing.

Timber is another important article imported through the canal. To the east of the Pennines most of the timber comes to Hull from Scandinavia and Russia, to the west it comes from North America to Manchester and Liverpool. The market is at Liverpool, but many of the ships, because they contain nothing else, go to Manchester to unload.

Fruit, particularly bananas, is another important article of import. The banana trade is a new trade and was established after the canal was opened. Manchester was chosen as the port of entry for the north because of its nearness to the source of supply, on the one hand and to a large consuming area on the other. The trade is

* *See Oldham, Geographical Journal, 1891.*

vessels could not enter. In 1697 it is described as "a little poor town, not a quarter as great as heretofore," and a century later the population did not number a thousand.

Then a new harbour was opened and prosperity returned. But this prosperity is really due far more to the railways than to the new docks. Fish must be rapidly despatched and if they are to be landed in thousands of tons so as to give rise to a great trade there must be abundant and excellent railway facilities. These Grimsby now possesses, and it receives such loads of fish, chiefly cod, whiting, and haddock, and flat fish like plaice or soles (all caught by line or trawl), that it has become the capital of the fish trade.

It may be added that in the docks there are ponds and tanks where cod and lobsters can be kept alive till they are wanted, ice factories, stores of ice from Norway, and fish curing and fish smoking establishments.

But even more characteristic in their situations are Yarmouth and Lowestoft on the far projecting coast of East Anglia, yet sheltered naturally from the stormy sea.

Yarmouth is the centre of the herring fishery. It is at a bend of the Yare. At this point the river turns to the south and runs parallel with the coast, leaving a narrow spit, not more than three quarters of a mile wide, at its broadest, between the river and the sea. Many of the rivers on the east coast have banks at their mouths, brought by drifts and tidal currents from the north so that they flow southward parallel to the coast. Old Yarmouth was built on this spit of sand, about two miles from the mouth of the river.

Old Yarmouth, rather than the new seaside resort, is the home of the fishing industry. It turned its back on the sea, and between 1284 and 1396 built a wall 2200 yards long and 33 feet high to shield it from the east winds, fragments of this wall still remain. The newer town is between the wall and the sea. As the area on which

shared with Bristol, which supplies the south of England with bananas as Manchester supplies the north. In this case there was no old-established market with which to compete, and full advantage has been taken of the canal.

There is much coal, many industries, and a large population in the north-east of England, and therefore the district contains a number of towns. There are suitable tidal estuaries and therefore there are large ports.

At the mouth of the Wear is *Sunderland*, a great ship-building centre because it possesses coal, iron, and deep water, like most of the seaports that face the Baltic, whence the necessary raw material is obtained, rope is made.

The Tees has another wide estuary surrounded by supplies of minerals and coal. Here there is another group of towns, the *Hartlepools*, *Stockton*, *Middlesbrough*, and *Darlington*. The first two smelt iron, export coal, and build ships, as might have been expected. Darlington uses coal and iron chiefly in the manufacture of machinery.

In 1829, less than one hundred years ago, there was scarcely a house on the site of Middlesbrough. In that year six men bought 500 acres of land on the south side of the Tees for £500. They traded in coal. Two years later iron was discovered in the Cleveland Hills and a steel factory was established. "And since then Middlesbrough, within one hundred years nothing but a dreary flat on the banks of an undredged river, has become a fine town with 100,000 inhabitants, scores of miles of streets, and a port into which ships of magnitude can enter, and a record of enterprise and hard work of which its people are justly proud" * This was in 1903. Now the population is 181,100.

But the most important of the ports on the north east is *Newcastle*, which stands at the meeting place of natural roads. (1) The road from Scotland by the plain that lies near the coast, (2) the road from London coming through the Vale of York between the Yorkshire

houses could be built was very small the streets were made exceedingly narrow. Hence the famous "rows" of which there are about one hundred and fifty, with a united length of nearly seven miles of dwelling houses packed on a space of 133 acres.

Just off the coast lies a sandbank, between this sandbank and the coast are the Yarmouth "roads" where the waters during a storm are calmer than they are in the



FIG. 47—MAP TO SHOW THE POSITION OF YARMOUTH

as those processes of curing which convert the herrings into kippers, bloaters, and red herrings.

Iorcestof resembles Yarmouth in that it is a great herring port. It is a little farther out to sea than its rival, Lowestoft Ness being the most easterly point in the British Isles. Near this point there is a quaint old colony where pebble built cottages and old red-roofed fish curing houses and net bending chambers are to be found. It owes something of its rapid rise, in recent years to the Great Eastern Railway Company, which has given to the town a fine service of fast fish trains.

Important as Grimsby, Yarmouth and other large fishing towns may be, not one of them is nearly so big

open. Such an open harbourage is not a very good one, but there is no better between the Humber and this part of the coast.

In the busy season, seven fish trains leave Yarmouth every day. In one day nearly 60,000,000 herrings have been landed here, and in 1911, 600,000,000 herrings were brought into the port. Such enormous quantities cannot be eaten at once, and so we get industries such as canning and potting of fish, as well

Moors and the Pennines, (3) the road from Carlisle and the west through the Tyne Gap (4) the sea roads from everywhere but particularly from the Continent and from London

At such a meeting place there was a bridge and a Roman camp though the camp that guarded the passage through the Tyne Gap was further to the west. William the Conqueror built a castle which was a *new castle* in his day and he gave the name Newcastle to the town that grew up around it. To day there is a twin town—Gateshead—on the other side.

Newcastle is situated where the two banks of the Tyne come close together in high cliffs. Here the Great North Road crossed first by a ford and later by a bridge and Newcastle is sometimes classed as a *bridge town*. The estuary of the Tyne is narrow and the banks at Tynemouth and Shields are steep. The river between Newcastle and the mouth has been widened and deepened and really forms a big natural dock.

On both sides of the river are coal iron ores and clay. There was coal in other parts of Britain but in earlier times most of it could not be used except locally, for the coalfields were far from the sea and there were no railways. Carrying coal by pack horses was slow and expensive. In the case of the Tyne the coal came right up to the edge of the river, so that the loading of the



FIG. 44.—MAP TO SHOW THE POSITION OF NEWCASTLE.

as the great ports used by the steamers that fetch and carry from and to the ends of the earth.

Fish has been landed and sold at *Billingsgate* wharf, the oldest on the Thames, longer than the mind of man can remember. At this wharf there was a small harbour that was used by small vessels; as the importance of the harbour increased stalls were erected for the sale of the fish. In these days, however, it is not the fishing boats so much as the railways that bring the supplies. Salmon comes from Scotland, cod and turbot from the Dogger Bank, lobsters from Norway, eels from Holland, and oysters from the Thames and the English Channel.

All the fish at *Billingsgate* is sold by number, except salmon, soles, and most white fish which go by weight, and sprats, oysters, and shellfish which are sold by measure. The market opens at five in the morning, when the regular fishmongers arrive and buy up the best qualities. They are followed, about seven, by the costermongers, who are said to sell one third of the fish bought in London.

The Fisherman.—So far we have seen three types of men at work in Britain—farmers, factory workers, and seamen and it is evident that they live very different kinds of lives. The operative is independent of the weather, has a roof overhead while he toils, and knows exactly at which hours he will have to work and when he can eat, sleep, and play. His hours are now more regular and shorter than those of almost any other worker in the kingdom. But his work is often very monotonous—the mere looking after machines, the air of the towns in which he lives is laden with smoke, and noise is as plentiful as smoke. His surroundings are dingy, ugly, and unromantic.

The farmer and the seaman are both dependent, to a large extent, upon the weather and can only labour when Nature permits. Hence their hours are irregular and, on the whole, much longer than those of the factory worker. But, on the other hand, their lives are lived in the open

ships was not a very difficult matter, especially after waggons were invented that ran down the steep banks by their own weight and, at the same time, pulled empty waggons up to the top of the slope. It was these advantages that, at an early date, made Newcastle such an important coal port.

Iron ore can be brought to Newcastle from Sweden and from the Cleveland district of Yorkshire. Hence we get a big iron industry and the building of iron ships, machinery and guns. There is salt in Durham, and this has given rise to the manufacture of chemicals and glass, both at Newcastle and *Jarrow*.

We see, then, that just as the use of coal has introduced great changes in the lives of people inland so the use of coal has caused great changes in the lives of people on the coast.

EXERCISES

1 Copy the map (Fig. 42) on a larger scale, insert contour lines for every 10 feet and mark the shallowest part of the channel.

2 Draw a map to show the importance of the position of Liverpool. Be sure to put in as many facts as possible which help to make Liverpool important.

air and amidst beautiful surroundings—the peaceful green fields and orchards in the one case the rest less changing fascinating, white crested ocean in the other

The seaman pursues his calling under circumstances that often make him the sport of storm and tempest, so that he adds to his irregular and lengthy hours, dangers that are quite unknown to those other workers we have so far considered. He goes to other lands and sees many different ways of life. The sea breeds a healthy, self reliant, clean blooded race to offset the wastage of the towns.

In days gone by it was the custom for a fishing boat and its gear to be owned jointly by those who sailed her and for the money received from the sale of the catch to be divided between them. This led to a feeling of equality and independence amongst fishermen which is not found in any other industry. Equality between man and man was the result of equality of sacrifice and of reward.

Yet there is no calling where the authority of the man in command is more unhesitatingly acknowledged. In times of stress and sudden danger some one must have responsibility and give orders. Here we have the union of individual responsibility and of discipline excellently developed.

Moreover, as the seaman was often absent for long periods from home, his women folk had to share with him the ruling of the household and the upbringing of the children, with the result that for long long years there has been more equality between man and woman in the homes of those who go down to the deep in ships than in the homes of those employed in any other industry.

There is scarcely any school of life to compete with that of the sea and this has been no little advantage to the people of Britain.

CHAPTER VIII

FISHING TOWNS

FISH is a valuable and cheap form of food, before the war we ate 2,400,000,000 fish meals in a year, or, to put it in a simpler way in 1913 one meal in twenty of every inhabitant of Britain was of fish. And it is interesting to note that if there were sufficient men nets and boats and enough ways of carrying what was caught to the homes of the people, the whole of the population of the British Isles could be fed on fish to-morrow.

On every coast there are little towns whose harbours are used chiefly by small fishing boats, these boats depend on sails and are called *smacks*. They are broadly built and have brown sails, and their departure at evening time for the night fishing is a never failing attraction to old and young alike.

Fishing—Sea fish are divided into two classes *bottom fish* and *surface fish*. The "surface" fish include herring, mackerel, sprats, pilchards, and salmon, all the rest are "bottom fish".

Bottom fishing depends on the fact that the seas round Britain are shallow. For a certain distance from any shore there is usually shallow water the land beneath which is called the *Continental Shelf*. No part of the Shelf is deeper than 600 feet, its width varies considerably, being wide where the shores are gentle and narrow where the shores are steep. In the north-west of Europe it is very broad and the British Islands stand on it. Thus

EXERCISES

1. Draw a map of East Anglia and the north of England. Mark the estuaries and the towns at the heads of the estuaries. Mark little old ports * mark great new ports * mark fishing towns +
2. Make a map to show when the herring appear off the east coast at different places (see p. 103)

the seas between Britain and the continent are everywhere shallow, the North Sea is everywhere so shallow that if St Paul's Cathedral were placed in it the top of the dome would be out of the water, while on the shallowest part the Dogger Bank the roof of a fairly tall house would be visible. The lowland of East Anglia where the wheat is grown is part of one great plain a portion of which is not far below the surface of the sea



FIG. 40.—THE CONTINENTAL SHELF ROUND THE BRITISH ISLES

The shallowness of our seas is of great importance in connection with the supply of fish. In the depths of the ocean where there is no light there is little life—it is only in shallow waters that there is sufficient light to permit that abundant growth of tiny plants which is necessary to support the millions of the ocean's inhabitants. For though big fish feed on little fish, and little fish on smaller

CHAPTER IX

THE WAYS TO SCOTLAND

Roads—All the towns we have described, all the towns that there are, as a rule, are placed where people can get to them easily and get to them by roads. Neither the towns nor the roads happen by accident. It was ease of travelling which made rivers so important in early times, as soon as boats had been invented, movement along many inland waters was not a difficult matter, and the ports, as we have noted were placed as far inland as possible in order that every advantage might be taken of the water routes.

Other things being equal, roads lie in the low lands, for it is less trouble to travel over level land than up and down the sides of hills and mountains. If marshes, swamps, or forests bar the way across the plains and the road is made to take to the hills it never climbs any higher than is necessary, if the high land has to be crossed, then men seek the lowest part where the crossing can conveniently be made. Usually, in this case, the road slants up the side of a river valley, for the top of the valley is usually the steepest part.

With railways the slope is even more important. The more gentle the slope the less the cost of making and working the railway, and the easier it is to run heavy trains at a high speed. Inasmuch as the railway seeks the gentlest slope it usually crosses high land by making use of the valleys but in most cases it avoids the steep bit at the top of the valley by means of a tunnel.

fishes, yet the smaller fishes feed on plants, and there are pastures in the ocean even as there are on the land. What we regard as clear water contains countless millions of minute plants which are eaten by the baby fish, the fish are the "cattle of the sea."

Then, too, the shallowness of the sea makes it possible to catch the fish that live on the rocks and sands at the bottom; if the water were very deep it might be difficult or impossible to capture them in the way presently to be described. The chief kinds of bottom fish landed in 1913 were—

Cod, 148,000 tons, haddock, 112,000 tons, plaice, 37,000 tons, whiting, 33,000 tons, hake, 32,000 tons

In addition there were haddock, dabs, bream, soles, turbot, brill.

Bottom fish, as the name indicates, live at the bottom of the sea; they are caught in a net shaped like a bag, which is dragged along by boats called *trawlers*. The lower part of the net disturbs the fish and causes them to rise, when they are caught by the upper part of the net and forced into the interior. The trawl moves slowly forward at about two miles an hour, and the fish are gradually drifted towards the narrow end. All escape is impossible owing to a flap placed at a short distance from the mouth of the net, it is so arranged that it will let the fish in but not out.

The full net is hauled up by winches, swung over the ship's side, unfastened, and the whole mass of living fish tumbled out on deck. When the trawl has again been "shot," the crew clean the fish and pack them in the hold between layers of ice. At the end of several days the ship may put back to port to unload.

At times the trawlers work in fleets and remain upon their fishing grounds for six and eight weeks. In this case the catch is packed in boxes and sent to port by means of steam carrier vessels.

Haddock and cod are caught by line. The lines may be as long as nine miles each and have

Roads and Railways to Scotland.—The way to Scotland has long been of importance to the dwellers in both England and Scotland. As we have seen, there are two such ways to the northern half of the kingdom. 1. One lies on the east of the Pennines and is almost everywhere on low ground. It is known as the Great North Road. 2. The second way is less easy than the first; it lies on the western side of the Pennines and has to climb Shap Fell before it can descend the Eden valley to Carlisle. Not only was the eastern road more important than the western because it was easier; it was also more important because the east of Scotland was itself more important than the west, just as, in England, Yorkshire was more important than Lancashire.

There were always two roads; there are in our times, three railways.

1. The first follows the line of the Great North Road; it is called the Great Northern as far as Doncaster, after which, as far as Berwick, it is the North-Eastern.

2. The second is the London and North-Western which runs west of the Pennines, over Shap Fell and down the Eden Valley to Carlisle.

3. The third road to the north is not really a route to Scotland at all. It is a new route to new towns, or to old towns which have become important since coal factories began to play such a big part in our national life. It runs to the Yorkshire coalfield, passes up the Aire Gap, over the moors to the Eden valley and so to Carlisle. It lies between the other two and is called the Midland.

By the first line we reach the entrance to Scotland at Berwick; by the other two we arrive at Carlisle. What then? What lies beyond? The high land that has separated the railways in England now seems to spread out and bar their way almost altogether. Because we so often study England and Scotland as separate countries we are apt to think of the high land in the north of England and that in the south of Scotland as different high lands.

of them as many as five thousand hooks ; the bait upon these hooks might be worth as much as £10. One end of the line is thrown overboard and sunk at a spot marked by a buoy and a flag. The steam "liner" then moves off till all the line has been paid out ; the position of the other end is marked by another buoy and flag. In about half an hour or an hour the line is hauled in and the fish taken from the hooks. A steamer has been known to catch £1000 worth of fish in this way in about a fortnight.

Surface fishing depends on the fact that fish, especially berring (and herring make up half the annual catch), come in from the open ocean to lay their myriads of eggs amongst the deep rocks. In 1913 the loadings of surface fish, were—

Herring, 011,000 tons ; mackerel 28,000 tons, sprats, 4,200 tons ; pilchards, 2,500 tons ; salmon, 2,500 tons

The figures, except for herring, do not look so very large, but they become much more striking when we remember that one ton of fish will give 3,000 people a good meal.

Surface fish swim on or near the surface, often in great shoals containing millions. They are caught by drift nets, drawn through the water by *drifters*, some of these are sailing vessels, others fine, large steamers. Modern steam drifters can get up a speed of nine to ten knots an hour, measure from eighty to ninety feet in length and seventeen to eighteen feet in breadth. Most of them are of wood and, previous to 1914, cost from £2000 to £2400, those that were built of steel were worth about £1000 more.

The drift net is let down into the sea and kept upright by heavy weights at the bottom and big corks at the top. When the net has been lowered the boat is allowed to drift. The fish swim head first against the net, get their gills entangled in the meshes, and so are caught.

At one time it was believed that the herring had its home in the cold waters of the north and that, at certain

They are really one, but cut into three blocks by the Tyne and the Aire Gaps. We have already dealt with the central and southern blocks; there remains the northern one, the *Southern Uplands* of Scotland and the *Cheviots*.

The Cheviots, with Solway Firth on the west and the lower part of the Tweed on the east, form the boundary between England and Scotland to-day. They are not high nor are they really difficult to cross, though they form a lonely region with few roads. They are, however, high enough to be a barrier to easy communication, fortunately they do not reach entirely from sea to sea. At either end there is a little low land, and across this lowland the eastern route through Berwick and the two western routes through Carlisle enter Scotland.

The Southern Uplands run from south west to north-east for a distance of about 120 miles, and any road that would go from England into those parts of Scotland where most people live must either cross this high land or go round it. The rocks of which these hills are built are old and hard and are either silty or gritty. Once upon a time they formed a broad tableland out of which the streams have cut deep, narrow valleys and left hills. The Southern Uplands are what is known as a *dissected plateau*. It is difficult to realise this when looking at the region from the plains that surround it, or from the floors of the valleys that cut it through; but the traveller who climbs the sides has no difficulty in the matter.

The silty rocks do not contain much plant food. The hills are mostly covered with short grass, though here and there are great stretches of peat and bog. There are no trees except in the valleys or where they have been planted to give shelter. The Southern Uplands, on the whole, are smooth, green, and fit only for sheep, the valleys, or dales as they are called just as in the Pennines, however, contain alluvium and rich boulder clay produced like the boulder clay of eastern England, by the action of glaciers, and have long been cultivated with all that skill for which the Scottish farmer is so famous.

seasons of the year, it came to warmer climates, as if obeying some call of Nature. It is now known that the home of the herring is in the North Sea and the Atlantic, and not far from the coast.

It was also believed that the fish passed from north to south, visiting in turn the various parts of the coast, from the north of Scotland to Yarmouth. This is also not true. The herrings come from the sea to the shore in straight lines, they make for those spots on the coast where it is convenient for them to lay their eggs.

Herrings are caught in enormous numbers, 60 000 000 have been put ashore at one place in one day. It is impossible to transport anything like this number in time to be eaten fresh. Many of the fish are therefore cured by being salted or smoke dried, after which they keep a long time. The work of curing is usually undertaken by Scotch herring lasses, who say that they follow the herrings from north to south. What they really do is to meet the herrings arriving, as already explained, from the open ocean.

They clean the fish, divide them into different grades and pack them in barrels with salt. They are exceedingly quick and skilful in their movements and earn quite "good money."

The herring season begins in the Shetlands about May, in June the fishermen are busy in the Moray Firth. In August there are shoals off the north east coast of England, and it is the turn of the Tyneside fishing ports, of Scarborough, Whitby, and then Grimsby. The last and biggest fishing of all is off Yarmouth and Lowestoft, in the autumn. From June to December our east coast is visited not only by British but also by Dutch, German, Belgian, and French fishermen. There is a much less important winter or spring fishing off Ayrshire, in the Firth of Forth and in the Moray Firth.

Position of Fishing Towns—Once the fish is landed, the next thing is to sell it, it must go to market like wheat. But because it is quickly perishable the markets, before

There are few people in the region; in fact, many parts of it are completely uninhabited.

Roads across the Uplands.—There are five ways of getting to the other side of the Southern Uplands.

1 The easiest route is that which forms the continuation of the Great North Road. It passes round the eastern end of the mountains, because it is the easiest, its existence adds to the importance of the Great North Road. It has been longest known and used, and its value is increased by the fact that for the most part, it lies along a fertile if narrow plain where men could settle and make a living.

For a short distance however, the hills end as steep cliffs on the coast north of St Abb's Head, and the road is made to follow a narrow valley some miles inland. This road has seen more than one battle between Scottish and English. *Dunbar*, especially, just where the narrow ledge of low land along the coast opens out to the plains at the north, is associated with such events, because of its position.

2 From Carlisle there is a choice of ways, all of which, however, are difficult or awkward. The first of these, beginning at the eastern side, goes up the valley of the Esk and Ewes Water, and then descends by the valley of the Teviot to Hawick. It thus reaches the valley of the Tweed, but is not yet across the Southern Uplands. It has to mount again by the valley of the Gala and pass between the Moorfoot and the Lammermuir Hills before the plain on the northern side of the hills is reached.



FIG. 45.—THE ROADS OF THE SOUTH OF SCOTLAND

the days of steamers and ice, had to be as close as possible to the places where the fish were caught. Hence *fishing towns*, which are, for the most part, fish markets as well, are unlike ports, they are not usually where boats can go far inland, but are *as far out to sea as possible*, due regard being paid to the necessity for harbours for sheltering the fishing craft.

Three quarters of the fish sold in the British Isles come from the North Sea, and the chief fishing towns are

on the east coast. The Scotch towns are Aberdeen, Fraserburgh, Wick, and Peterhead, the English fishing towns are London, Grimsby, Hull, Lowestoft, and Yarmouth. With the exception of London and Hull, they are all seen to be on projecting parts of the land.

Hull, as a port, we have already mentioned. Its sheltered position and its nearness to



the Dogger Bank have made it the seat of an old and valuable fishery, though it has now many other interests.

Grimsby has all the advantages of Hull as a fishing town, inasmuch as it is sheltered by Spurn Head, is near the Dogger Bank, and has deep water for ships. And it has two advantages over Hull, for it is nearer both to the Dogger Bank and to London. Hence it has been a busy port since the fourteenth century. At one time it was a rival of Hull, but its harbour gradually silted up and big

3. Another route ascends the valley of the Annan and descends the valley of the Clyde. This has one big climb of about 1000 feet to the summit of the Beattock Pass.

4. The next route uses the valley of the Nith—a long roundabout way.

5. The fifth route runs along the southern coast and then along the west coast. It goes round the western end of the mountains as the road from Berwick goes round the

eastern end, but it is so long and roundabout that it also is of little importance.

Two things will be noticed. The first is that only one route proceeds from Newcastle and Berwick, while there are four from Carlisle. The second is that the eastern routes are, on the whole, the most important, and that the most western is of very little account. This is because the Southern Uplands in particular, and Scotland in general, lie further west than England. From Berwick, opposite the end of the hills, there is one good route

Fig. 49.—DIAGRAM TO SHOW WHY THE EASTERN ROADS OF THE SOUTHERN UPLANDS ARE MOST IMPORTANT

Roads enter only between the two arrows, while more than half of the Southern Uplands lie to the west of the western arrow

to the north, from Carlisle, opposite the centre of the hill country, there is a choice of several good routes to the north, none of these is, however, very convenient.

Railways across the Uplands.—The modern railways follow much the same routes as the ancient roads, with one important exception to be noted presently.

At Berwick the North British joins the North-Eastern and runs mainly round the coast, though at first it has to come inland just as the Great North Road does.



■ Land over 6000 ft.

There is a railway along the southern coastal plain to Stranraer, which connects with a line along the west coast and so to Glasgow.

The Glasgow and South Western Railway uses the Nith valley over to the plain of Ayr and runs, as its name shows to Glasgow.

The Caledonian Railway is the Scottish continuation of the London and North Western Railway, it ascends Annandale, crosses the Beattock Pass and runs down the Clyde valley to Glasgow. By the Beattock route the road, the river and the railway run within a few yards of each other for many miles. This reminds us of the Aire Gap where there are also a railway and a river but two roads instead of one and a canal in addition. Such a collection of means of communication in a narrow strip points to the value of gaps and valleys.

But the fifth railway which is another branch of the North British does not follow the old road. There is no railway along a good part of the route that was formerly trodden between Carlisle and the valley of the Tweed from Langholm to Hawick. The railway line ascends the valley of the Liddel rises to a height of about 1000 feet and crosses the Cheviots by a tunnel about a mile in



FIG. 50.—ROUTES SOUTH OF HAWICK
Roads cross the high ground at the lowest passes the railway where it is most easy to make a tunnel

expression a "fall of one inch of rain" during any given time means that if all the rain that fell on the ground during that time had stayed on the ground, so that none had been lost by evaporation or drainage, or through other causes, then the ground, if flat, would have been covered uniformly with water to the depth of one inch.

The instrument by which the amount of rainfall is measured is a *rain-gauge*, it consists of a funnel with which to catch the rain and a vessel in which to receive it. The rainfall is measured once a day, with a measuring jar, which is so marked that the amount of rainfall can be read directly. A full glass would represent a rainfall of half an inch. The divisions on the glass represent tenths and hundredths of an inch of rainfall.

The thermometer changes continuously, so that its variations can be shown by a continuous line. When we record temperature observations we record what the temperature was *at the time of observation*. But rainfall is irregular and cannot be shown by an unbroken line. We record the rain that has fallen *during a period*. Instead, therefore, of drawing a line, little shaded rectangles are used, they may be regarded as a series of pictures of the contents of the glass jar which measures the rainfall, the heights of the rectangles show the amount.

If the rainfall for, say, January at a given place be measured every year, for, say, thirty years, and then the sums of all these January rainfalls be divided by thirty, we get the *mean monthly rainfall* for January at that place.

If the total amount of rainfall at a given place be found every year for, say, thirty years, and then the sum of all these *annual rainfalls* be divided

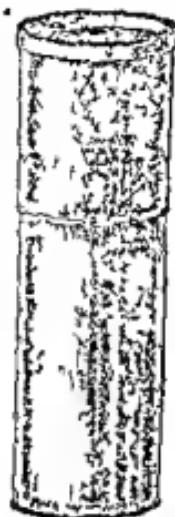


FIG. 63.—RAIN GAUGE

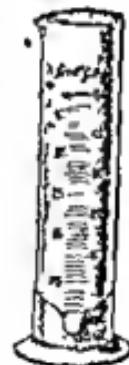


FIG. 64.—MEASURING GLASS

length. This is a more difficult route than the old one and the question arises as to why the railway did not use the easier way.

A reference to a map will show that the valley of the North Tyne cuts right up to the Cheviots. Now from Hexham in the Tyne Gap there is another railway that also makes for the valley of the Tweed, and needs a tunnel in order to get there. To avoid cutting two tunnels when one could be used instead, the line from Carlisle to the Tweed valley was taken by a longer and more difficult route than would have been chosen had there been no other line to think about. The two railways join a short distance before the entrance to the tunnel. This is a case where the road is made to the lowest pass, the railway to the point where it is most convenient to tunnel. Even the road which follows the Liddel valley crosses at the top at a different point from the railway.

The route up Liddisdale and on to Edinburgh is called the "Waverley" route because it runs through the country where Scott, the author of the Waverley novels, lived and worked.

A Border Land.—It has already been noted that there are few people on the hills, and if we scan the map we shall fail to find any large centres of population in the valleys. The truth is that the Southern Uplands, of themselves, are not of very great importance. Mountain regions, like deserts and seas, are usually places across which people may have to travel, but in which they do not usually choose to linger. The mountains may, however, play a great part in history if they lie between two peoples who either wish to trade with each other or to fight each other. And that is where the value and the importance of the Southern Uplands arise. They separated England and Scotland, the real boundary is not the line on the map, not even the Cheviots, but the broad, sparsely populated tableland that covers, not only the southern part of Scotland, but the north of England also.

The Romans, in fact, did not think of Scotland as

by thirty, we get the *mean annual rainfall* at that place.

As our chief rain-bearing winds come from the west and, in northern Britain, are compelled to rise at once by the mountains, they are soon cooled and the moisture they contain is condensed upon these high lands so



FIG. 53.—BRITISH ISLES. MEAN ANNUAL RAINFALL.

that the rainfall is heavy. As the winds pass farther and farther to the east, they lose more and more of their moisture, so that the east, as in England, is much drier than in the west. This may be seen by comparing the rainfall at Scourie in the west of Sutherland, and Dunrobin in the east. The rainfall at Shoeburyness, in Essex, is added for comparison with both :

stopping at the Cheviots, but at the Tyne Gap, and it was on the north side of this gap that they built the Roman Wall, running from Wallsend on the Tyne to the Solway. When the Romans left the country many changes took place and many events occurred, of which the history books take note, but the upland mass ever remained a boundary.

The early history of Scotland, after the departure of the Romans, resembles that of England. There were separate kingdoms that warred upon each other till the strong man came who could weld them together. One of these kingdoms was Strathclyde, it stretched from the Clyde to the Ribble, that is, along the greater part of the western side and half of the upland region, and it was inhabited by Britons.

On the eastern side there was an English kingdom, Northumbria, which stretched from the Forth to the Humber (Northumbria is probably not "the land north of the Humber," but the "land of the Northanhymbras"). With the fortunes of these two kingdoms, Strathclyde and Northumbria, we have no further concern in these pages, except to point out that the boundary between them was the upland mass which forms the subject of this chapter, and to note that whereas, in Roman times, it formed a boundary running



FIG. 61.—BOUNDARIES BETWEEN ENGLAND AND SCOTLAND

	Scourie (west)	Dunrobin (east)	Shoeburyness
	inches	inches	inches
Jan.	4.09	2.57	1.21
Feb.	3.37	2.46	1.15
Mar.	3.21	2.23	1.13
Apr.	1.13	1.77	1.24
May	2.03	1.70	1.18
June	2.37	2.05	1.38
July	3.31	2.44	1.72
Aug.	3.51	2.60	1.61
Sept.	3.56	2.66	2.32
Oct.	5.18	3.31	2.10
Nov.	4.71	3.43	2.20
Dec.	5.04	3.39	1.46
 Total	 42.1	 30.61	 18.0

There are other places in the west where the annual rainfall is as high as 80 inches and the summits of the western mountains are rarely free from mist or cloud.

The heavy rainfall gives an abundant supply of water



FIG. 56.—RAINFALL AT SCOURIE.

As the rainfall is not constant it cannot be represented by a constant line which at present runs to waste in turbulent torrents and leaping cascades but some day it may be of great value. We are gradually learning to use water power and already there are water driven works in one or two places in the Highlands, as at the Falls of Foyers near Fort Augustus in the Caledonian Canal. Here the falling water power

east and west, it next formed a boundary running north and south

Finally, in our time it forms a boundary running from south-west to north east. That one and the same stretch of high land can form a boundary in more than one direction points first to the fact that we are dealing not with a mountain range, but a plateau, and, secondly, that a boundary was not so much a line as a district with little or no population

Still there were always some people in the valleys where water was obtainable and where sheep could be reared. And these people grew up different in character from either the people to the north or the south of them. People who live in frontier lands tend at all times to become independent in character and in action. They need energy and enterprise, and because they are inspired with the spirit of freedom they do not readily submit themselves to restraint.

When the frontier is also a boundary region between two hostile people who cross it from time to time to make war upon each other, freedom tends to become lawlessness, and the abounding energy of the people finds an outlet in warfare. It was often of little use to cultivate fields that opposing forces might any day trample underfoot, or to rear cattle that might any day be stolen or slain. So the inhabitants of the border, "strangers to industry, averse from labour, and unacquainted with the arts of peace, subsisted chiefly by spoil and pillage"**

Going across the border to steal your neighbours' cattle was an honoured occupation. The Borderers were strong, resolute, passionate, proud, rough and cruel, and lived a life of robbery. But they were devoted to their clan leaders, never broke their word, hated traitors and cowards, and were fond of tale and song.

In 1603 Scotland and England were united, and slowly but surely great changes have taken place. Practically all the land that is arable has been brought under

is converted into electric power, which is used for the extraction of aluminum from its ores.

Ice.—The Great Ice Age, some of whose effects we have already seen in England, produced changes in Scotland equally striking and important. All vegetation was destroyed, all life rendered extinct; the land was buried in heavy falls of snow that squeezed the bottom layers into ice and covered the surface with a great ice-sheet. As the ice moved over the surface and slid down to the sea it ground and polished the surface, wore down the hardest rocks, and smoothed the sides of the glens.

Much of the rubbish produced by this action formed thick sheets of boulder clay, and big blocks of granite, gneiss, and schist were carried by the ice, to be deposited later, perhaps far to the south. When the ice had all melted, the sea, rains, streams, springs, and frosts began their old work again, widening and deepening old ravines and cutting new ones.

Snow still falls heavily in the Highlands during the winter, but the mountains are not high enough for permanent snow. Some snow stays till August or September on the north-east side of the highest mountains; in most years it melts, but occasionally it will remain on the north east of Ben Nevis till next winter.

Another marked feature of the Highland scene is the lakes, or *lochs*, most of which are "ribbon-lakes," and lie in the deep parts of the long, narrow glens. In some regions the glaciers have deposited moraines across the end of a narrow glen and held up the water, so that these lakes are of the same kind as those of the Lake District. The stream that always issues from the lake is continually cutting deeper through the barrier and lowering the level of the lake. When the outlet through the barrier has been sufficiently deepened the lake will be drained away altogether.

In other places, the lakes lie in great hollows that have been scooped out of the rocks by the glaciers. Such are

the plough and farming has reached a pitch of excellence that is proverbial. A greater change has come to certain parts with the rise of the factory and the mill.

A region such as we have been describing is not likely to possess many towns or any large ones. There are indeed but few towns and these all small. But one or two of them are interesting enough to deserve notice.

Along the coastal plain of the south there is a road running to Stranraer, whence ships go to Belfast in Ireland. Through the valley of the Nith there is a road connecting Glasgow with England. Dumfries stands where the road to Ireland past Kirkcudbright meets the road to Glasgow by way of the plains of Ayr, the value of this meeting point is further increased by the presence of a tidal estuary deep enough for ships. Dumfries is therefore

port, market town, and railway junction. It can be classed also as a bridge town, it possesses the oldest bridge in Scotland.

In the neighbourhood are fertile plains where cattle are reared and where milk and cheese are made.

Hawick is the market town of the upper Teviot valley where roads and railways meet. In the neighbourhood of Hawick there were sheep pastures, and there was also plenty of clear running water. These early gave rise



FIG. 52.—MAP TO SHOW THE POSITION OF DUMFRIES.

the lakes in Glenmore, that have now been joined together by the Caledonian Canal

The ice sheet has done something to make movement a little more possible than would otherwise have been the case. It lowered the passes and thus made them easier to cross, and formed the lakes that are, of themselves, convenient water roads. It helped, also, to prepare those valley trails that next became roads, some of which are to-day followed by railroads.

The sea lochs are specially noticeable on the west coast where the sea runs inland in numerous long narrow, and winding *firths*. These lochs are valleys, part of which is under water, there is, as a rule, no well marked boundary between the part where the land end finishes and the sea end begins, the sides of the land valley just continue on and form the sides of the sea valley.

At one time people fancied that these lochs were due to the action of the waves, that had washed away the softer rocks and left the harder ones still standing. But the sea does not work in such a way as to produce inlets like those we are considering. Indeed its action is exactly the opposite: it smashes up the seaward ends of long thin pieces as at A, Fig. 57, and carries sand, etc., to fill up the landward ends of the valley, as at B so that the effect of the waves is to make the coast less rather than more indented.

The sea lochs are *drowned valleys*, the land was sunk and the sea water has entered to take the place of the river and the waterfall. The valleys themselves were cut by streams and smoothed and perhaps deepened by ice. The sea lochs add very much to the beauty of the western Highlands, but they have rendered large parts of the coast uninhabitable. The valleys, had they not been



Fig. 57

to a woollen industry, first in the houses and then in the mills by the water side. The particular kind of cloth made in Hawick and other towns of the Tweed valley is called "tweed" but not after the name of the river for it is an altered form of "twill". The industry became so firmly fixed that it has not migrated to the coalfields, coal is brought to the factories. Luckily it has not to be brought very far as coal is obtainable in the Lowlands.

The coming of steam driven machinery to such a district is not an unmixed blessing, for though it has brought wealth and has perhaps increased wages, the standard of living and the price of land, yet the factories have polluted the air, desiled the water, and besmirched the linn sides. It has also rendered the border land more lonely than ever for the people have left the glens and crowded into the towns.

Dumfries is an excellent illustration of a market town at an important road junction, Hawick is an interesting illustration of a small manufacturing town growing up out of an agricultural village, Berwick, our last example, has these and other interests.

Berwick stands at the meeting point of three important roads. First, the road south along the east coast to London, second, the road north along the east coast to Edinburgh, third, the road through the valleys of the Tweed and the Gala to Edinburgh. It possesses also a small estuary, and was at one time a market for the wool bought by Flemish merchants from the other side of the North Sea. Woolmarket St still preserves the memory of this ancient trade. In one respect the old site is unfortunate. The road between England and Scotland here keeps close to the coast and is not ten miles from it as at Newcastle. The result is that the old bridge is also close to the sea and with its low arches has since it was built prevented any attempt to use the river for traffic. All that is of use is the estuary as a harbour.

The junction of these roads was guarded by a castle

drowned, might have been occupied by fields and villages.

But the sea does have some effect. The waves tend to wear away the shore between high and low water. Cliffs may be formed and the material spread out just below high-water mark as in Fig. 58, so that a notch is formed on the slope from land to sea.

Now the land is sometimes lifted above the sea and sometimes depressed beneath it; there is never complete rest. And here, on the west coast, there can be seen the notches of old sea beaches, twenty to twenty-five feet

above the present sea-level (Fig. 59), pointing to a time when the valleys were even more drowned than they are to-day.

Along these *raised beaches* roads can be carried round the base of the hills and, where they are very broad, farm-houses and even small villages can be found. Some of the old sea-caves, now left high and dry, are roughly walled in, and used as stables by farmers.

FIG. 58.—BEACH AND CLIFF.

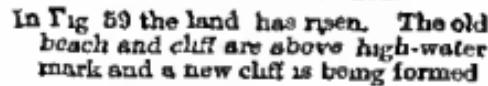


FIG. 59.—RAISED BEACH.

In Fig. 59 the land has risen. The old beach and cliff are above high-water mark and a new cliff is being formed

Vegetation.—The Highlands, then, have thin or no soil and a very damp climate. Moreover, they are, on the top, colder than any of the other high lands in the British Isles. They are colder chiefly because they are higher.

What will grow under such conditions? First of all grass grows on all the slopes. Then there is an abundance of swamp-loving plants which invade the tarns and lakes, or flourish in the marshy ground; these, in course of time, as we have seen, are converted into peat. This peat furnishes a supply of fuel to the people who live in the valley below.

whose site is now occupied by a railway station, and by walls, which are still complete on every side.

There are fertile plains where farmers can make a living, and there is the sea to provide a livelihood for fishermen. Hence we get at Berwick the two industries of boat-building and the manufacture of agricultural implements. These three towns are the biggest in the Southern Uplands, and yet their populations are quite small.

In 1921 Dumfries had 15,775 inhabitants; Hawick, 16,353; Berwick, 12,994. These figures look even smaller when they are compared with those for some of the English towns we have already studied. Thus, a little old world place like York had, in 1921, nearly 81,000 inhabitants, and a big modern manufacturing town like Leeds 438,820. Leeds was twenty nine times as big as Dumfries.

Yet though the towns may be small, the industries few, and the wealth limited, the Southern Uplands must always remain important as the district through which roads must pass between the thickly populated parts of England and Scotland. But in this connection it must be remembered that it is the eastern half of the Uplands that carries the roads, the part west of the Nith is of less importance.

EXERCISES

1. Draw a contour map to show a railway route up one river valley and down another with a pass of about 1000 feet above sea level intervening between the two valleys. Give as an example any such route you know of in the British Isles. General School Examination (London, 1919).

2. Draw maps to show the positions of Hawick and Dunbar.

Next there is *heather*, beautiful enough in its purple glory, and of some value as a food for sheep ; the heather-covered upland also supports deer, grouse, and rabbits which provide sport for hunters.

And there are magnificent *pine forests*, especially in Strath Spey, near Aviemore.

The People.—The thin soil, the short summer, and the damp climate are all against farming. Where the grass grows there are pasture grounds for sheep. Highland cattle with shaggy sides and wide-spreading horns are also reared.

There is a certain amount of *agriculture* in the valleys, but the climate is too wet for wheat or barley, and it is difficult to dry even hay. The one grain that can stand the damp and the cold is *oats*, with its long drooping glumes which shed the water during the flowering period, and even oats may not be reaped till November.

There is no coal, and, except wool and grain, there is nothing to be manufactured, even if coal were brought. The wool is scattered widely, and it is more profitable to gather it into small lots and send it to the Lowlands and elsewhere. Some of the grain is used locally in the manufacture of *whisky*. It follows from all this that the Highlands are sparsely populated. The Highlands contain six-tenths of the area of Scotland, but they contain only one-tenth of the population.

The rugged mountains and the deep glens interferred with the movement of people from one place to another. The Highlanders, who are descendants of an early people driven from the Lowlands, lived, first of necessity and then of choice, not on the mountains, but in the deep glens. Living thus, separated from each other and the rest of the world, they became members of a *clan* rather than of a nation ; they were devoted and loyal followers of a local chieftain—they were “clannish.” Then, too, in order to live at all, it was necessary to be hardy, industrious, and thrifty.

The Highlander is therefore a fine type of man—proud

CHAPTER X

THE HIGHLANDS OF SCOTLAND

IN the far north of Britain there is a kind of land different again from any of those already studied. It is higher than the Pennines or the Southern Uplands; at the same time it is not raised so very far above sea-level if we compare it with the really high land in other parts of the world. The Scottish Highlands practically occupy all Scotland north of a line drawn from Stonehaven on the east coast to the Firth of Clyde at Kilegreggan, on the peninsula between the Gare Loch and Loch Long.

They are cut into two by the long, narrow valley of Glenmore. To the north of this glen they are known as the Northern Highlands to the south as the Grampians.

A Dissected Plateau.—As we look over at the Highlands from the Lowlands of central Scotland they stretch like a great wall across the country. If we go no farther we shall get the impression that we are at the foot of a range of mountains, and fancy that if we ascend the steep and rocky slopes we shall find a steep and stony descent upon the other side.

But climb to the summit of the highest peak, Ben Nevis, and it will be seen that there is "a wonderful orderliness and even monotony in the waves of that wide sea." These mountain tops and ridges tend to rise up to a general level. Along the sky-line, the wide sweep of summits undulates up to a common level, varied here and there by the line of some strath or glen, but yet wonderfully persistent round the whole panorama. If,

of his country, independent, keen-witted, courageous, and loyal. He has been compelled to leave his beloved hills and glens and go out into the world because they were too poor to support a large population. And wherever he has gone he has conquered.

few as the people are, there once were and there could be more. People have actually been driven out of land that was inhabited in order to make way for deer and grouse. Thus, between 1811 and 1820 the Duchess of Stafford drove 15,000 persons from her estates. To hurry the emigration she burnt not only single houses, but whole villages. In one night 300 houses, representing four parishes, were burned. Even to day large estates are in possession of one man and have tended to grow larger and larger. Such owners have deliberately continued the policy of depopulation. To-day great stretches of country are entirely uninhabited, and in all the mountain regions there is not one town. Most of the people in north Britain live outside the mountains, along the east coast plain, to these we shall return presently.

The farms, which are few in number, are called *crofts*. The crofter has no shops within reach, and he has to learn to depend on himself and make the most of his opportunities and surroundings. He has an unfavourable soil, an unfavourable climate and few good markets at which to sell his sheep and cattle.

He builds his but of stone from the hillside. As there are few trees, it is, as a rule, only in the framework of the roof that much wood is found. The crofter thatches this roof with the straw from his oats, or even with rushes or heather, and feeds his fires with peat that he cuts and dries for himself.

He grows potatoes, and also oats for his oatmeal cakes and porridge, his cow gives him milk and butter, and his fowls provide him with eggs. He seldom eats meat, for though he has sheep he rears them to sell and not to put on his table. Before he parts with them he often cuts off

as sometimes happens in these airy regions, a bank of cloud with a level under-surface should descend upon the mountains, it will be seen to touch summit after summit; the long line of the cloud defining, like a great parallel ruler, the long level of the mountain ridges below" *

What we are looking at is not a series of true mountain ranges at all, but the remnants of an ancient plateau. If all the rock that has been removed to form the valleys could be replaced, we should see the Highlands as a wide, undulating tableland, sloping generally towards the east. This is another dissected plateau, something like that of the Southern Uplands, but, owing to differences of height and of the rocks of which it is made, the hills have a much more rugged outline.

It is a fascinating story, too long to tell at this stage, of the slow wearing down of the ancient land and of how the greater part of the ancient rocks of the Highlands were sunk under the sea and covered with layers of sandstone that filled up the valleys and formed a wide, gently undulating plain on the bed of the ocean. Then this plain was raised above the waters to become dry land once more, and once more wind, frost, and rain began to carve and saw the land into that mass of pyramids, cones, precipices, crags, crests, and pinnacles that forms, in our day, the attraction of the Highlands to tourists.

This wearing of a plateau into a series of hills and valleys we have already seen in the case of the Pennine Moorlands and the Southern Uplands. The effect is more striking in northern Britain because of the greater hardness and variety of the rocks and because of the way the rocks lie. Each kind of rock gives rise, under the influence of the weather, to different forms. Sandstone, quartzite, granite, and schist each adds a different attraction to the landscape. If the rocks lie horizontally, as is generally the case in the Pennines, the outlines are smoother than in the Lake district where they are often inclined at a considerable angle.

the wool, this his wife spins into yarn and weaves into cloth

If the crofter lives near the sea he is a fisherman as well as a shepherd, it is the abundance of fish in the rocky creeks of the western shore that accounts for a thin fringe of population on that side of Scotland

Roads to the North—The Southern Uplands and the Pennines are not very productive, but, as we have seen, they possess considerable importance because they each lie between two sets of people who wish to communicate with each other. But the Highlands lack even this advantage, they are on the road to nowhere. They lie off all the commercial routes, and no one needs to pass through them to get to anywhere else. Even Caithness, which is a lowland plain, is of little importance.

In England there are two easy roads to the north, in Scotland there is only one, and it gets less and less important the farther north it goes. The English north roads lead to the densely peopled plains of Scotland, the Scottish north road leads chiefly to thinly peopled and unproductive regions.

On the west there is no easy road at all. The mountains run out to the sea in bold and rugged cliffs, and the sea runs into the land in long narrow inlets. It is difficult to travel by land along such an indented coast. A journey in a straight line from the head of one inlet to the head of the next, as AA, Fig. 60, would be rugged and steep while a road that followed the coast, as along BB would even if it were possible, be exceedingly lengthy. There are so few



FIG. 60.

The greater part of the high land is composed of schist and gneiss with upstanding masses of granite rising here and there to form such mountain blocks as Ben Nevis. Schist and gneiss are what are known as 'metamorphosed' or 'changed' rocks. They have been changed from their original form and character by the enormous pressures to which they have been subjected while being raised and bent. Gneiss looks something like granite but the minerals of which it is composed are arranged more or less in layers. It has probably been formed by the crushing of granite.

Mica schist looks slaty at a distance, it is composed of alternate layers of mica and other materials usually very much crushed, bent and twisted by the enormous pressures to which they have been exposed. It is the commonest of all the metamorphic rocks. The schists and granites are much harder than most rocks found in England and do not wear away anything like so quickly as such soft rocks as limestone and chalk. These rocks break down under the weather into a soil that is too thin for farming, here and there there is not even soil merely wide expanses of bare rock.

The *glens* deep narrow, steep sided valleys are one of the commonest features of the country. They differ in appearance from the gentler dales of the Pennines or the Southern Uplands but for the most part they were made in the same way. Rain fell on the land and ran back to the sea by means of the easiest route that could be found. Once the path had been chosen the stream flowed along it century after century slowly widening and deepening the channel. Tiny streams united to form brooks and these gathered together to form larger streams and then broad rivers as they neared the ocean. The work never ceased and every fresh shower and every fresh frost helped to hasten the rate at which it was being accomplished.

Agents of Denudation — Rain — The chief of these is rainfall whose amount is measured in inches the

people that it does not pay to construct many roads. At the beginning of last century there were no made roads in Sutherland at all, and in many parts of the interior there were not even tracks.

But the sea is there, and in the absence of land roads it is used as the great north road of the west, so that communication is carried on chiefly by steamboats, though there are now one or two railways, noted further on, that cross from the east to the west.

On the east side of Scotland there is, as in England, fairly low land, and here is to be found the greater part of the population. Here there are boulder clay and fertile soil; the rainfall is lower than on the west, and the summers are long enough and dry enough, in places, to allow wheat to ripen. Cattle are also reared, and the sea provides another rich harvest—herrings; here, too, is a coast which faces Europe and is provided with good harbours. There are many places with over 5,000 inhabitants and one or two larger places that need fuller mention.

When describing the Southern Uplands it was pointed out that although there was low land along almost all the coast, the extension eastward of that coast had led to the making of a short cut through a valley north of the Tweed between Berwick and Dunbar.

In the same way, as we go farther north, we can either follow the long road round the coast, or cut off a long detour by ascending a valley which at first is called Glen Tay, then Glen Tummel, and finally Glen Garry. It crosses the Grampians and descends partly by Glen Spey. The two roads unite near Culloden and then cross the Ness at Inverness.

If there are few roads there are fewer railways. The railways that have been made follow the main roads. They naturally either follow the coast on the east or cut across by the Tay-Tummel Garry valley to Glen Spey. From Aberdeen the Great North of Scotland Railway runs along the coast to Elgin, where it joins the Highland

Railway, that comes by the short cut through the mountains. This latter railway continues to the fishing town of *Wick* and to *Thurso*, and sends a branch westwards to *Kyle of Lochalsh*, whence boats run to *Stornoway* in the Outer Hebrides. Other railways have also been made at considerable expense through some of the western valleys.

The Caledonian has an important branch to the tourist centre of *Oban* the only town of any importance on the west coast, while the West Highland Railway runs from the mouth of the Clyde to *Fort William* and on to *Mallaig*.

Towns.—At *Inverness* we have the meeting place of



FIG. 61.—MAP TO SHOW THE POSITION OF ABERDEEN AND INVERNESS.

two roads to the south, the road to the north and the road through Glen More. All this means a bridge, a market, and a town, and Inverness though a small place, is bigger than any other in the Highlands. The market is not a large one, for there are few people and much of the surrounding country is barren rock with neither agriculture, coal, nor manufactures though the coast plains of the Moray Firth and Easter Ross are excellent farming lands. Inverness is the natural centre of a larger area than any other city in Britain and is correspondingly important.

Aberdeen is the one really large town on the borders

of the forests of the Congo and the Amazon to dry. The trees of which the Carboniferous Forests were composed were unlike those in the present forests, for our forest trees had not then evolved, but included ferns, horse-tails, club mosses; some of these were trees five feet in diameter and fifty to seventy feet high. Fancy a club moss fifty feet high!

"Picture the conditions of that prehistoric era. Tropical forests amid the marshes and the swamps; forests steaming with hot moisture and growing with rapid strides like a gourd in the night; and after lasting their appointed time, passing away into the ground to become fossilised."

Formation of Coal.—The fossilising of the forest produced the deposits of coal. And the method of the fossilising was something like this. As parts of the plants died and fell into the swamp, they did not rot away, but formed a soft mass out of which new plants continued to grow. Sometimes the land slowly sank a little, and so much water covered the surface that these plants died.

The forests were slowly hidden under layers of mud and sand, and when the water

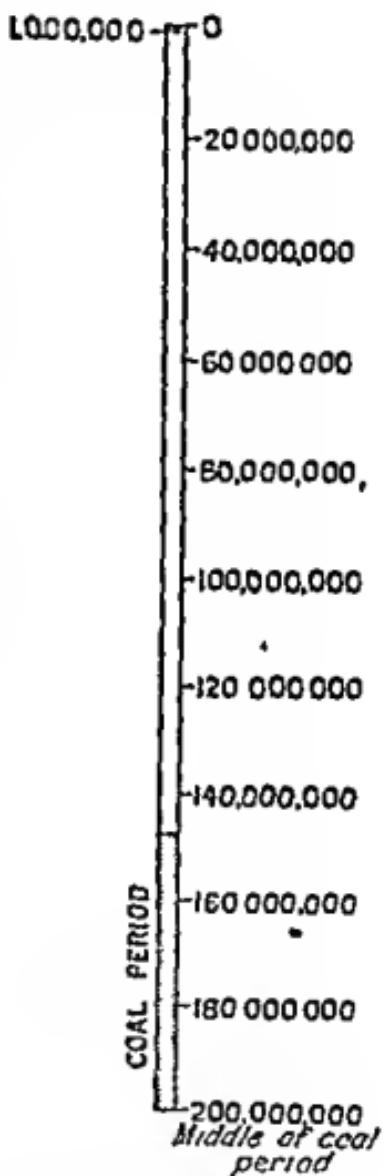


FIG. 61.—TIME SCALE TO SHOW ROUGHLY WHEN COAL WAS FORMED

The million years of Fig. 63 has shrunk to the little black portion at the top.

of the Highlands, it is not really *in* the Highlands. It is on the eastern plain at a point where the plain is very narrow, so that all the traffic from the north and south along the plain must pass through this spot. At one time it was only a fishing village, far out, and opposite the North Sea fishing grounds. Aberdeen is on a river and receives roads from the valley of that river, the Dee, and also from the valley of the Don. It is on an estuary and so it is a port.

There are herrings and other fish in the sea, salmon in the rivers, granite and slate in the hills, and cattle on the plains. Here, too, men build boats for the fishermen, and make cloth from the wool of the Highland sheep. Aberdeen is naturally by far the most important place in this part of Scotland.



FIG. 60.—COUNTIES AND COUNTY TOWNS OF NORTHERN SCOTLAND

Notice the county towns in black on the east coast road. Inverary marked by a circle is exceptional.

the big towns were chosen as the places from which to govern the country around them, and that they became the county towns of the counties thus formed. Now in the Highlands practically all the towns are on the east coast.

In the northern highlands of England the county towns are partly on the west and partly on the east road. But there is no west road through the Scottish highlands, only an eastern one, and it is therefore on the

The Highland Counties — We have learned that

became shallow again, more of these curious trees and plants grew thickly over it as they did before. Then the ground sank again, and once more the forests were buried in sand and mud. This happened time after time.

The plants that had been buried were squeezed together and so changed that, in the course of the succeeding centuries, they became beds of *coal*, at the same time the layers of sand were converted into *sandstone* and the mud into *shale*. After a long, long time all these beds were slowly lifted up and bent into enormous folds.

Mining Coal—Our coal supplies lie, then, in layers or *seams*, buried under and separated by layers of stone and clay. The seams are comparatively thin, some of them are only a few inches thick, and the thickest of all, in Staffordshire, is only 30 feet. The thinnest seams are unprofitable to work.

The first person of importance in coal mining is the geologist, who from his knowledge of the rocks that compose the crust of the earth is able to state whether or not, at a given place, coal is likely to be found below the surface. If the scientific man thinks it is worth while trying, engineers are employed to bore holes at different points. The boring tools bring up samples of the rocks through which they pass and enable the engineers to obtain information as to the presence of coal seams, their thickness, and depth.

FIG. 70.—SECTION OF COALBURN PIT LESMANAGOW.

The black portions represent coal seams.

and depth.

If it be decided that coal is present in sufficient quantities to make the mining of it pay, shafts are sunk. As soon

eastern one that the county towns, the seats of government are to be found. Here is a little lowland, and all the Highland counties, except Argyll, come to the east coast, and many of them extend to the west coast, and even take in islands like the Hebrides some distance away.

The conditions of Argyll are peculiar. By both its history and its geography it is associated with the sea. Its coast line is deeply indented and there is no point in the county more than twelve miles from salt water. At the same time it is shut off on the land side by a highland barrier. This isolated self-contained region early fell an easy prey to Scandinavian Vikings and later allowed pirates and others from Ireland to gain a footing in what is now Scotland.

About 563 Columba, a Christian missionary from Ireland, landed with twelve companions to establish a missionary station and preach the gospel. And it is interesting to note the position of the spot chosen for this station. The only roads were sea roads, and what was needed was a place where the sea roads met, this was found in the island of Iona. Here the sea-way from Ireland divides northward into the Minch and north eastward to Glenmore^{**} and here the monastery and church of the missionaries were built. From this bare and isolated rock spread an influence that helped to unite the other warring factions that divided the country between them until *the great* *unification* efforts



FIG. 63.—MAP TO SHOW THE POSITION OF IONA.

* Mackinder, *Britia and the British Seas*.

as the bottom of the shaft is reached, and its sides have been bricked up where necessary to prevent them falling in, two passages, each about 12 to 14 feet broad, are driven in opposite directions.

At right angles to the main roads, narrow passages are driven at regular intervals on both sides. Connecting passages are also excavated so that, in the end, the whole seam is broken up into a number of immense blocks. When the coal is excavated and the big square pillars are thus removed, wooden props are erected for the support of the roof. In 1912 the cost of the new pit props used in the mines of Britain was £3,700 000.

The coal is cut away by hewers, assisted in some modern mines by machinery driven by electricity or compressed air. It is loaded into small trucks which are pushed along the passages by boys. At certain places the trucks are fastened together and drawn, by ponies or electricity, to the bottom of one of the shafts, where they are raised by steam driven machinery.

On reaching the surface the coal is screened and sorted, the large lumps are separated from those of small size, while the dust is piled into another heap.

Great trouble is taken to ventilate the mine in order that the miners may have pure air to breathe, it is necessary to carry away all the dangerous and poisonous gases that are given off in blasting operations, or which escape from the coal. In order to avoid setting fire to any inflammable gases that may be in the mine, special safety lamps are used, these give out a feeble light, but are so constructed that they can be burned with safety in an atmosphere that would be exploded by the use of a naked light.

Besides the geologist, the mining engineer and the men who bore, sink, and make the shaft, the mines employ mechanical engineers to attend to the machinery, men to cut and transport the coal, a veterinary surgeon to look after the pit ponies, firemen who are responsible for the safety of the mine, as well as a host of clerks and officials.

towards the formation of Scotland as a nation. This was really not possible in the glens of the Highlands. But in the Lowlands this was possible, so in the next chapter we shall consider the Lowlands.

EXERCISES

1. Plot the rainfall at Fort William and at Ben Nevis as in Fig. 56. What do you observe?

2. Plot the curves of yearly temperature at Fort William and Ben Nevis. What do you observe? Can you give any explanation of the facts?



Land contours at
intervals of
250 feet
Statute Miles

Sea 0 50 feet
- 50 100 -
- 100 200 -
below 200 -

FIG. 56.—LOCH LONG AND LOCH GOIL.

3. Draw (a) a section east and west across Fig. 56 to show how Loch Long and Loch Goil are related to the surrounding country.
 (b) Sections along the middle line of these lochs. What do you notice?

In 1918, 1,008,867 people were employed in and about the mines of Britain, and they raised 227,748,654 tons

The Miner.—The life of the miner underground is a most unpleasant one. He toils more or less in the dark, his work is dirty, and the tax on his physical strength is great. There are dangers to be faced—falling coal, fire, and explosions. Not a day passes without the death of three or four miners, and something like 400 are injured more or less seriously during the same period. In 1918 the number of deaths from accident was 1,420.

"Hard work, constant risk, and high pay have made the miner a different type of man from many of the other toilers in the land. He has plenty of self esteem, but is inclined to be reckless and to love danger for danger's sake. His love of taking risks shows itself even in his pleasures, and he has the reputation of being fond of gambling."

The use of coal has thus introduced ways of living different from those of the old purely farming days. But the change has not affected all the lowlands. We have seen that the area is divided into two parts by a belt of hills. It is only in the southern portion that coal is found and industrial towns have grown. In the northern portion farming is still the important occupation. The coal is found in three districts, in the west, in the centre, and in the east.

The Coalfields.—The Scottish coalfields, like the English coalfields, are named from the places where they are situated. Thus we get (1) The Ayrshire coalfield (2) The Lanarkshire coalfield (3) The Midlothian coalfield (4) The Dunfermline or Fife coalfield. The two latter are sometimes grouped together as the Firth of Forth coalfields. The coal raised on these fields finds different uses in different regions.

As cotton requires a damp atmosphere its manufacture is associated with the wetter west. Curtains are made in Glasgow, and Paisley has the largest cotton-thread mills in the world.

CHAPTER XI

THE LOWLANDS OF SCOTLAND

THOUGH some measure of unity, temporal and religious, was achieved in the Highlands, and though the Southern Uplands are important, yet neither the Highlands nor the Southern Uplands are the real Scotland, the Scotland that matters. The real Scotland is the region lying between the two higher regions. This is a different kind of region from the Highlands, where one-tenth of the population live on six-tenths of the area. Here eight-tenths of the population live on one-tenth of the area. This region is sometimes called the Midland Valley and sometimes the Lowlands. Neither name is a good one.

This wide, hilly region is certainly not a plain, and is only a valley in the sense that it lies between two mountainous regions; it is not altogether lowland, for it is plentifully dotted with hills and has a long chain of heights running across it from south-west to north east, but, on the whole, it is lower than the land to north and south.

It is about fifty miles wide and contains a number of low-lying fairly level pieces of ground; these are either



FIG. 63.—POPULATION OF SCOTLAND

In the east are those drier hillsides that are most suitable for the rearing of sheep for wool. As we have seen, some of the coal is sent into the Tweed valley for use in the woollen factories of Hawick (hosiery) and Galashiels (tweed).

The area contains not only coal but also iron, and the limestone that is used in smelting the iron ore. The manufacture of iron and of steel are therefore two important industries, and as this industry is not affected by the climate it is found on all the coalfields, the chief seats of the industry are, however, on the Lothian coalfield at Coatbridge, Airdrie, Motherwell, Wishaw, and Falkirk.

Coal and iron, both close to the sea, tend to give rise to the building of ships, and the Clyde estuary is the most important shipbuilding area in the world. From Glasgow to the sea there is a long line of shipbuilding yards, important centres are Port Glasgow, Dumbarton, and Greenock. Some of the biggest ships in the world have been built on the estuary of the Clyde.



FIG. 71.—SCOTTISH COALFIELDS

The places where the ships are built are called "ways", on these rest a number of wooden blocks, and upon the blocks is laid the keel or backbone of the vessel. The ways and the wooden blocks are thickly coated with tallow to allow the sliding of the vessel into the water when it is launched.

After the keel has been laid down, the sides of steel plates are fastened to the ribs by means of rivets, about

narrow plains by the sea or broad open valleys called *straths*

The glens of the Highlands and the dales of the Southern Uplands lead down to the straths of the Low



FIG. 66.—THE HEART OF SCOTLAND

lands. Glen Tay leads down to Strath Tay and Clydesdale to Strath Clyde.

The belt of hill ranges—*Campsie Fells*, *Ochil Hills*, *Sidlaw Hills*—which divide the valley into two parts is the result of great volcanic outbursts. Sheets of lava were poured out from the interior of the earth, as the

one hundred rivets being required for each pair of plates. When the work has progressed far enough, the joiners cover the steel decks with wood and fit up the other wooden parts of the ship and the ship is ready to be launched.

At a given signal the wedges that have kept the vessel in position are knocked away and she glides slowly into the water. She is then fitted with her engines, either at the place where she has been built, or if this be not possible, in some other yard. Painters, decorators, and other workmen put on the finishing touches. Marine engineering that is, the making of engines for ships, is one of the chief industries on the Clyde.

One important result follows from the fact that the coalfields exist on part of the old farming area. There has been less change in the distribution of population than in England. The cities that were most important in the old days are the most important cities still. Perth and Stirling are still market towns in the agricultural district, and Glasgow has grown very greatly.

Glasgow.—In early times Glasgow stood on the rich soils of the Clyde valley, and was within reach of a number of agricultural and pastoral districts. It was at the point also where the Clyde could be easily crossed, and so was a suitable site for the market that these districts needed. As early as the twelfth century there was an annual fair in the town, there was, at a fairly early date, sea traffic with Ireland.

To-day Glasgow is the great centre of the Lanark coal field. It owes its importance partly to the geography of the region where it stands, and partly to the character of the people who made use of those advantages and overcame disadvantages that might have deterred a less determined race.

At Glasgow meet the natural roads from Stirling and from Edinburgh and the Forth along the south side of the Campsie Fells, the roads from England via the Annan valley and the plain of Ayr, and that from the Highlands via Dumbarton and Loch Lomond. It is, furthermore,

lavas were harder than the rocks by which they were surrounded, they have been less worn away, and now stand out to form the ranges mentioned above

It may not be out of place here to point out again that many of our mountains are of their present shape and height not because they were lifted up above the rest of the land, but because they are made of hard rock. As a matter of fact, the summits of some of our highest mountains were originally the floors of valleys. It is only the wearing away of the softer rocks around them that has left them upstanding in the landscape.

Farming.—The main occupation of the people of the Lowlands of Scotland was, till recently, farming, like that of the inhabitants of the English lowland. The valley contains the most plentiful supply of rich soil in Scotland. It is so far north that it is, on the whole, too cold for wheat, but a small amount of this grain has been grown, for centuries, on the drier, sunnier, eastern side, especially in Fifeshire and Haddingtonshire.

On the hill pastures sheep and cattle are fed, most sheep being found in the drier east, as in the Pennines.

Between the edges of the Highlands and the line of volcanic hills is the long wide, flat floored, fertile plain of *Strathmore*, where heavy crops of barley are grown for the use of the whisky distillers.

Between the Sidlaw Hills and the Firth of Tay is the *Carse of Gowrie*, where both fruit and wheat are grown, a fact which points to a warm, dry summer.

This variety of agricultural produce called for markets, and small market towns were not uncommon. Others were larger and more important; two were very important—Perth and Stirling. We have seen that a row of volcanic heights crosses the lowland and divides it into two parts. This row of heights is itself divided into separate sections by three rivers or their estuaries, the Tay, the Forth, and the Clyde. These gaps are naturally of great importance, and in the past their importance was even greater. They were occupied by Dumbarton, Stirling, and Perth.

at the lowest point where the Clyde could easily be bridged. As already pointed out, this made Glasgow a market town for a fertile plain hundreds of years ago in the twelfth century, and a cathedral was built even earlier.

On the other hand, the estuary of the Clyde was so shallow that a hundred years ago "high water was hardly perceptible at Glasgow—it came up an insignificant ripple." Then, too, before the discovery of America all the trade was with Europe, and was carried on by the



FIG. 72.—MAP TO SHOW THE POSITION OF GLASGOW.

ports of the east. There seemed a better chance for Greenock, nearer to the sea, to rise to importance.

A great spurt in the upward growth of Glasgow began when trade with America was established. The town was suitably placed for trade with America and was approached by a broad estuary sheltered by the peninsula of Cartyre. In 1718, for the first time, a ship brought tobacco from Virginia and Maryland. Later, cotton replaced tobacco and established the textile

Perth and Stirling, like Aberdeen and Inverness, are in the east, on the "east coast road"; the road is not actually along the coast, for that would have meant long and tiresome journeys. People had to go far west in

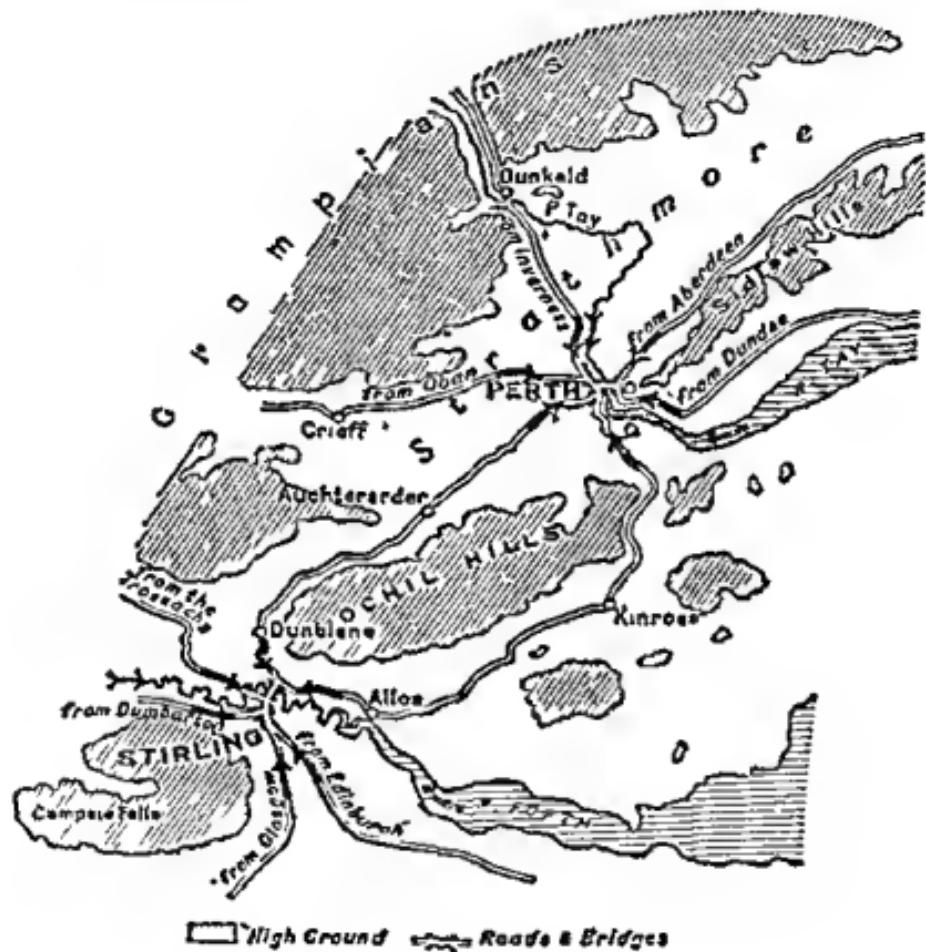


FIG. 67.—MAP TO SHOW THE POSITION OF PERTH AND STIRLING.

order to cross the Forth. Thereafter the road enters the low strip between the Highlands and the Ochils and keeps pretty close to the mountains all the way to Aberdeen. It crosses the heads of the two large estuaries in the east

industry in the country, where the using of coal and the manufacture of iron had already been begun on a big scale

But the Clyde was a poor river for a growing and ambitious city. The grandfather of one of the authors has waded across the Clyde where great ocean-going vessels are now moored. So the Glasgow people deepened the channel by dredging, they blasted out a rock that extended for 1000 feet across the river, they straightened out the banks and they used the scientific labours of Smeaton and Watt to help their own perseverance and foresight. There is something more than geographic advantage in the site of Glasgow.

To day we can set down as advantages for Glasgow things that did not count for much until comparatively recent times. These would include rich supplies of coal and iron and its position opposite the New World.

The utilisation of all the natural advantages has given to Glasgow steel ships, engineering works of all kinds, sugar refining, cotton and woollen mills, and chemical works. The deepening of the river brings up the ships, the lowness of the plain brings in the railways and the canal. How fast Glasgow has grown may be judged from the following figures —

1500	2 000
1600	7 000
1707	13 000
1740	17 000
1780	43 000
1801	77 385
1851	329 096
1901	761 709
1911	1 034 069

By means of eight lines of railways Glasgow has radiated out over the Lowlands. *Grangemouth* (near the mouth of the River Forth) has been called the port of Glasgow on the Forth.

Edinburgh — The easiest road from England to Scotland is the eastern one. When it enters Scotland it runs

of Scotland by two bridges. At the one bridge is Stirling at the other is Perth.

Perth stands at the gap cut by the Tay between the Ochil and Sidlaw Hills. The town is at the lowest point where a bridge could formerly be built at the head of an estuary and at the meeting place of a number of land roads, these roads come from Stirling (one on either side of the Ochil Hills) from Dundee round the coast of the Firth of Tay, from Aberdeen through Strathmore from Oban and the west coast, and from Inverness and the north by the valleys of the Tay and Spey. At one time the capital of Scotland was here and to day Perth is an important railway junction. It was and is one of the largest markets for Highland sheep.

The water of the Tay at Perth is abundant in quantity, pure in quality, and suitable for dyeing, the Perth Dye Works are known everywhere.

Stirling is another bridge and gap town. It is in the gap cut by the river Forth between the Ochil Hills and the Campsie Fells and at the lowest point where the river, formerly, could be bridged. As the Forth and its estuary stretch almost across Scotland they formed a very effective barrier, and the bridge was most important. * Stirling is at the meeting place of the following roads from Perth two (one on either side of the Ochil Hills) Edinburgh, Glasgow, Dumbarton and the estuary of the Clyde, and from the valleys of the Forth and its tributaries.

Roads and river, gap and tide, town and fort. And at Stirling there is a high rock, the plug of an old volcano on which a castle was built to defend the bridge in time of war, a fact that is remembered in the crest of the town—a bridge.

Stirling is naturally now an important railway centre.

Coal—The use of coal has made a difference in Scotland as in England, and thus is a convenient place to

* See *Kidnapped* Chap. 26.

a little inland because of the cliffs of St Abb's Head, but it soon descends to the eastern coast again, and by the narrow low coast plain enters the Lowlands.

A short cut can be taken via the valley of the Tweed and the Gala, and this in due course also emerges into the Lowlands, where it meets the coast road, near the end of the Pentland Hills.

The western route to Scotland after leaving Carlisle, has the choice of several roads which have already been discussed. It will be remembered that one of these climbs up the Liddel valley, goes down into the valley of the Tweed and then up the valley of the Gala and down into the plain. It thus joins the eastern route. Where these routes meet is Edinburgh.

The junction of the chief roads from England could scarcely help being an important site on this account alone. But the same point is also on the edge of the Lowland Plain, and therefore has easy connection with the sea, both on the east and the west. And in addition, there are the roads to the north that radiate from this point. At the junction there is a high rock, the plug of an ancient volcano, providing a suitable site for a fort.

Edinburgh then, possesses many natural advantages of situation. When the English first settled in this part of Great Britain they, of course entered by the east coast, and the Kingdom of Northumbria stretched, as we have



FIG. 73.—MAP TO SHOW THE POSITION OF EDINBURGH.

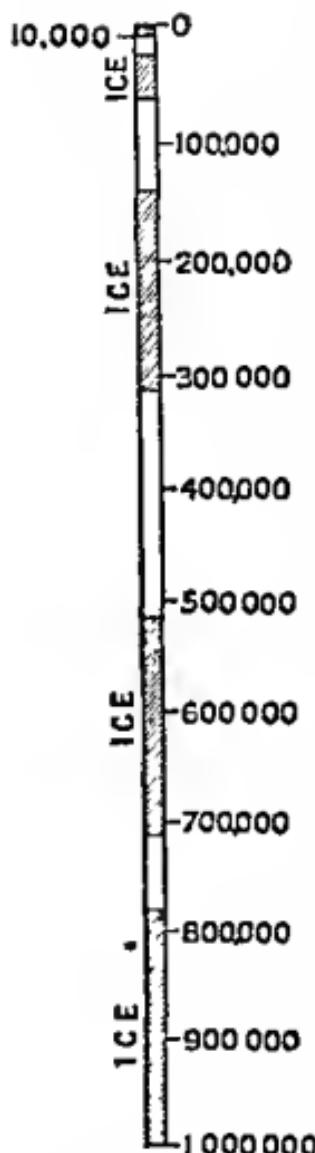


FIG. 68.—TIME SCALE OF THE ICE AGE IN YEARS.
The last ten thousand years is represented by the black portion, at the top.

speak of the conditions under which coal was found and the methods by which it is mined.

We cannot study the geography of the world to day without constantly speaking about climate; and we cannot understand the geography of the past without some reference to the climates that existed in far off times. We have, for instance, already referred, more than once, to the time when Britain had an Arctic Climate—the period of the Ice Age. Now the Ice Age happened only a few hundreds of thousands of years ago. What we may call the Coal Climate, that is the climate which helped to produce coal, happened perhaps two hundred million years ago, and lasted for a period of millions of years. This period is the Carboniferous (or Coal) Age. If we made a time scale in which an inch stood for 1000 years, the Norman Conquest would be placed less than an inch from the end, the beginning of the Christian era less than two inches, the beginning of Egyptian history about seven inches, and while the beginning of the Ice period would be about 100 feet, the coal period would be between three and four miles.

The climate of the Coal period was warm and moist, and giant vegetation flourished in the swamps and at the mouths of mighty rivers; it was even more luxuriant than that

seen, from the Humber to the Forth. The king of this early English kingdom was Edwin, and his capital was Edwin's hury, that is Edinburgh. And as the place at which the most important road from England enters the most important part of Scotland, Edinburgh is, and has for long been, the capital of Scotland.

Modern Edinburgh is not only capital, market, and railway junction. It is also the seat of a number of industries. Amongst these are milling, brewing and distilling, paper making and printing.

Of the two latter Mr Chisholm writes as follows: "One of the leading industries of Edinburgh is printing. This is due to the presence of the law courts. When the courts are sitting, a great deal of printing has to be done, and much of that on short notice. The consequence is that all those who share in the business have to keep a larger staff than can be constantly employed on legal business, so as to be ready for emergencies. This urgent work is necessarily highly paid. Thus a certain number of Edinburgh printers, with this lucrative market on the spot, are able to increase their profits by estimating for publishers' printing at an exceptionally low rate. In slack times they turn their men on less urgent work, which is put aside when the urgent orders for legal business come along.

"The printing industry of Edinburgh requires paper and printer's ink, both of which have long been manufactured in the district. Paper in great quantity is an obvious requirement of every dense population in an advanced community, and as the materials and the product are both heavy and bulky it is advantageous to carry on the manufacture in the neighbourhood of any such population where the other conditions can be found."

Amongst those other conditions are water of suitable quality and ease of access to the supplies of raw material. The first exists abundantly in the local streams, and the

other—pulp or timber for making pulp—comes from the countries of North Europe, just on the other side of the North Sea.

Leith—Edinburgh is not on the sea, but is connected with its port Leith, on the Firth of Forth by what was till recently a road some three miles long bordered by a long line of houses. Leith, like many other Scottish seaports, is on a raised beach, its little natural harbour has been now extended into a series of six docks that receive ships, chiefly from Europe. These ships bring grain, flour, esparto grass (for paper making) and wood, they carry away pig iron made on the Lanarkshire coalfields ale, coal and ammonia. The latter, together with oil, is obtained from beds of oil shale that lie on the edge of the Lanarkshire coalfield. In the broad street that connects the capital and the port has been seen an interesting illustration of geographical influence in a minor matter. Leith on the terrace, has electric trolley cars, Edinburgh, on account of its hills, had cable trams.

In olden times the roads followed the lowlands along the coast or made short cuts from point to point through easy passes in the hills and the way from the south to the north of Scotland was long and roundabout. It was impossible then to construct big bridges over wide estuaries. The modern engineer, however, can build bridges almost anywhere, and to shorten the road to the north of Scotland, the Forth and Tay have been bridged by bridges over a mile in length. This has led to the lessening of the importance of Stirling and the increase in the importance of Leith on the estuary of the Forth and of Dundee on the estuary of the Tay.

Big ships cannot now get to Perth, they stop at Dundee. The trade of Dundee is naturally with the North Sea countries like Russia. From this country came large supplies of flax that were used in the making of linen. During the Crimean War these supplies were cut off and the people of Dundee turned their attention to

necessary to examine the relief and the weather of Ireland before we can settle what kinds of farming will be possible in the country.

Highlands and Lowlands.—A map of Ireland shows that there are not one or two large masses of high land as in Scotland, but many small ones. There is no central backbone as in the Pennine moorlands, and there are few "ranges" anywhere. The low lands are not in the east as in England, nor between two masses of high land as in Scotland. A low part stretches across the middle from east to west, and forms the Central Plain, but, all over Ireland, lowlands wind away from this, in and out between the hills and mountains and along the coast.

The mountains in the north fall into two groups: (1) the mountains of the north west, where they are chiefly of schists and granite, like those of the Scottish Highlands. Like those they abound in magnificent highland and coast scenery, but they are nowhere fertile. (2) the mountains of the north-east, which are mainly of volcanic origin. Ages ago, long before the ice period, during some of the crushing to which the land has been exposed, great cracks appeared in the district in the west of Scotland. These cracks extended miles into the ground and through them came hot melted



FIG. 75.—IRELAND.

Another fibrous plant, jute, which is brought from India To day Dundee has flourishing linen and jute industries, jam also is made from the fruit of the Carse of Gowrie, and marmalade from oranges that may easily be brought from the Mediterranean by vessels coming from India with jute

Glasgow and Edinburgh Aberdeen and Dundee are by far the largest cities in Scotland, and they are all in the Lowlands

The Importance of the Lowlands.—As summarising the importance of this area we cannot do better than quote the words of Geikie “ It is the lowlands that have mainly contributed to the material prosperity of the country. In these more fertile regions have lain the chief elements of progress. The broad valleys and plains, eroded by the rivers and strewn with the soil carried down from higher grounds, have determined the sites of our principal towns, and the distribution of the great centres and belts of population. Our industrial progress is the story of the exploration of lowland coalfields and iron mines. Our commercial progress is the story of the deepening of lowland rivers, the construction of lowland harbours and the building of the network of lowland railways ”

EXERCISES

1. Show the Basin of the Tay in the same way as the Basin of the Ouse (Chapter III. Exercise 1) and compare it with that of the
2. Draw the curves of yearly temperature at Glasgow and Aberdeen and compare them with that of Norwich (Fig. 5). What do you learn?
3. Draw maps to show what parts of the country could most easily be governed from (a) Aberdeen, (b) Inverness.

rock from below. This spread out to form a great sheet from the north of Ireland through what is now the channel between the Hebrides and the mainland. A great portion of this rock has been slowly worn away, but some of it remains in Mull and in the north of Ireland. Some of the sheets of rock on cooling cracked into six-sided pillars. These are well seen in the Giant's Causeway in the north of Ireland, and in Fingal's Cave in Staffa west of Mull.

In the south there are, in Cork and Kerry, a number of parallel ranges and valleys running east and west.

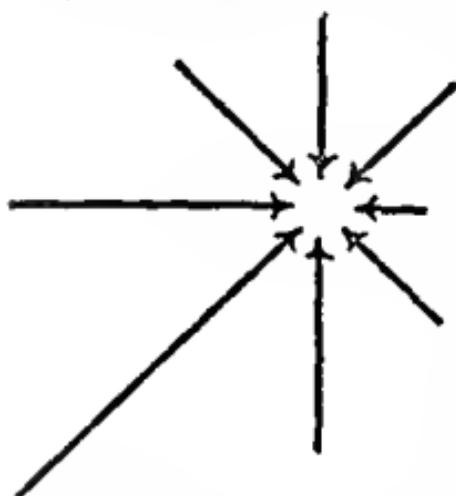


FIG. 76.—WINDS OVER BLACKHEAD POINT
1906-1915 (10,000 observations)

The English plains are usually of clay or of sand, the Irish plain has a foundation of limestone.

Climate—We have seen in Chapter I that one reason for the distribution of rainfall over Britain arises from the fact that on two days out of three we have westerly winds. This is of course the case also in Ireland as is seen in Fig. 76 where lines are drawn to a length proportional to the number of times winds were observed from directions from which they are drawn. It is obvious that westerly and south-westerly winds are the most common. Let us

amongst these be the picture lakes of Killarney, the mountains often rise steeply from their sides and are clothed with forests of timber and underwood. The coast resembles that of Scotland inasmuch as it possesses a number of long narrow inlets which are drowned valleys.

But far more important than the mountains as far as the people of Ireland are concerned is the Central Plain. This differs from most of the English plains in soil and position. The

CHAPTER XII

FERRY TOWNS

In dealing with the means of communication between England and Scotland we have been mainly concerned with land routes, though it must not be forgotten that there is also much traffic between these two countries by sea. In dealing with the way to Ireland we are bound to consider sea routes, for Ireland is separated from us by water—the *North Channel*, the *Irish Sea*, and *St George's Channel*.

Goods go to and from ports, and these ports, as already explained, are situated as far inland as possible, in order to make the fullest use of the cheaper water routes. For many classes of goods the most important question in connection with their transport is cheapness, but for some other classes of goods—fruit, live cattle, etc.—speed is often of greater importance than cheapness. And in the case of passengers and mails it is practically always speed and not cheapness that settles the routes.

To travel quickly one must travel by land, not by water. The land journey may be longer than before and the cost of travelling may be greater, but the time taken will be less, and, to the business man, "time is money." Hence railway lines that convey passengers or letters to some place where they can be shipped across narrow seas frequently terminate at some point which is as far out to sea as possible in order to shorten the slower water route. Such terminal stations are *ferry towns* or *packet stations*. As the boats require shelter they are usually placed, not

examine this matter further. Fig. 77 shows how the winds were blowing over Western Europe on May 7th, 1914. The wind at Yarmouth was south and at Glasgow



it was east. It appears to be blowing round a centre off the coast of Lancashire. This arrangement of winds is called a *cyclone*. Fig. 78 shows how the wind was blowing

actually at the end of a far projecting cape, but close to it in a little bay or estuary where there is some protection from violent winds and boisterous waves. They are in positions somewhat like those of fishing towns but with this difference, ferry towns are usually on narrow channels and there is a second ferry town on the opposite coast, while fishing towns tend to face the open sea.

Such ferry towns in Britain are placed either on the short routes between Great Britain and the Continent, or on the short routes between Great Britain and Ireland. On the south east we might expect to find ferry towns. Here, for a short distance, England is divided from the Continent only by the narrow Strait of Dover, which between Dover and Calais measures only 22 miles, and can be crossed by fast steamers in less than an hour.

In the days when America was unknown, and when the south east of England was the richest and most important part of Britain, all our overseas traffic was with the continent of Europe, and the narrowest part of the sea passage was of great importance.

On the English side there was a small stream, the Dour, emptying itself into the Strait just where the coast of England and Gaul (France) came closest together, and in the little estuary was built the ferry town of *Dover*. It was there before the Romans came, and it was there that Caesar and his men would have landed had they not been prevented by the Britons. At that time the natural harbour was bigger than it is now, and the sea ran inland for some distance. The outlet of the stream was, in time, blocked by siltage drifted up the Channel from the west, and the harbour was silted up. Still it was necessary to have some kind of harbour at Dover, because it was such an important link in the chain that binds us to the Continent, and because also in time of war, Dover is important in the defence of the country. Hence much money has been spent in constructing an artificial harbour, one of the greatest of its kind in the world.

next day. At most places it has changed. It is now south-west at Yarmouth, and at Glasgow it is from north-west. The winds appear to be moving round a centre



FIG. 78—WINDS OVER NORTH-WEST EUROPE AT 7 A.M., MAY 5TH, 1914
(A cyclone.)

between Scotland and Denmark. The centre of the cyclone has moved to the north-east. From a study of these two maps we can see two things: (1) Here is a case

Dover is one terminus of the South Eastern and Chatham Railway, and is the most important of the ferry towns for France.

A little further south along the coast from Dover, but separated from it by chalk cliffs, and supplying a short route, is Folkestone, the ferry town for Boulogne in France. The history of Folkestone is something like that of Dover. There was first of all a little haven at the mouth of a stream between the cliffs. This haven was silted up in the same kind of way, and then, in 1842, the South Eastern Railway built the present harbour. "Since that date so much shingle has accumulated west of the pier that a built over tract now extends at the foot of the cliffs which once formed the western headland of the haven."*

Passing still southwest along the coast of the Channel so that the sea journey is longer, we reach Newhaven, the ferry town

for Dieppe in France, the terminus at this point of the London, Brighton, and South Coast Railway. It lies at the mouth of the Sussex Ouse, and has been a ferry town since the days of Elizabeth. The harbour has a pier on each side, a breakwater half a mile long, and a fort above to protect it.

The distance from Newhaven to Dieppe is 67 miles, while that from Folkestone to Boulogne is 26 miles, and that from Dover to Calais only 22. The journey takes three hours instead of about one hour, but the fare is lower and the scenery between Dieppe and Paris is more



FIG. 74.—FERRY TOWNS OF THE SOUTHEAST

where the winds were blowing from different directions in different parts of Britain, and yet the weather as a whole came from the west. This is a very common occurrence. (2) We can see on either map places where one current of air or wind, represented by an arrow or two, seems to be running into another current, represented by another arrow. Wherever this happens one or other of the currents must rise and be cooled so that rain may fall there, whether there is high ground or not. Currents may come from different directions without there being a cyclone. It is mainly for the reason that currents meet that there is rain over the plains of Ireland and England, but there is naturally more chance of rain over the plains of Ireland where the winds are damper than over the plains of England though on any one day there may be more rain in England as winds may be meeting there when they are not meeting over Ireland.

Ireland is surrounded by water, and this tends to make the winter warmer and the summer cooler than would be the case were Ireland surrounded by land. The climate is therefore equable, nowhere are there any great extremes of temperature. As might be expected the average temperature is lower in the north than in the south but the difference is not very great.

Ireland lies right in the track of the south westerly winds that blow so frequently in the British Isles. And these westerly winds bring not only rain as already explained, but they bring warmth as well. For as they blow, on the whole, in one direction across the Atlantic Ocean they set the surface water of the ocean in motion and drift it towards the north east.

This water is not hot as a bather in Irish seas in December would pretty quickly discover but as it comes from the south it is a great deal warmer than we have any right to expect sea water to be so far north as Ireland. The winds blowing over this warm water carry its warmth inland to all parts of the British Isles and it is this warm surface water and the westerly winds (and not the Gulf

interesting than between Calais and Paris, so that for persons who do not fear the sea this is a very popular line of travel.

Just about as far north-east of Dover as Newhaven is south west is *Harwich*, the ferry town for Holland and Belgium, and the terminus at this point of the Great Eastern Railway; the distance to the Hook of Holland is 103 miles. It might be thought that Harwich is not far enough out and that Lowestoft and Yarmouth would form better ferry towns; but a look at the map will show that the sea journey to the Continent from Lowestoft and Yarmouth is no shorter than that from Harwich, while the land journey from London is longer.

Harwich is on the best natural harbour between the Humber and London, a harbour formed by the estuaries of the Orwell and the Stour; it is distant from London only one and a half hours by train, and by sailing from Harwich rather than London a long, slow water journey down the estuary of the Thames is saved. Places like Harwich, which relieve river ports like London of part of their burden of traffic, are sometimes called "*out-ports*," and Harwich might be described as not only a ferry town for the Continent, but as an outport of London as well.

Very little is exported from Harwich, and its imports are mainly those things that require speedy transport—butter, eggs, meat, fish, and poultry.

Now let us consider the shortest way between Scotland and Ireland. The Scottish ports nearest to Ireland are in the south-west, and the map shows that Glasgow on the Clyde and Belfast on Belfast Lough are conveniently situated for traffic with each other. Both are placed far inland, and yet the distance between them is only 116 miles. For the conveyance of heavy goods between the two countries, Belfast and Glasgow form a pair of useful and suitable ports. But there is a shorter possible journey for passengers. Actually the way which would give the shortest journey by sea would be through the

Stream) that give the British Isles their mild weather in winter. Ireland, in particular, has very mild winters.

Fig. 79 shows the parts of the Atlantic Ocean warmed by the West Wind Drift. The British Isles lie in such a position that they are well surrounded by it. The shape of that part of the ocean warmed by the drift is something like that of a gulf, and this area is often referred to as the *Winter Gulf of Warmth*.



FIG. 79.—WINTER GULF OF WARMTH ROUND THE BRITISH ISLES

Vegetation—Ireland is a wet land, and on the whole a low land. Some of the low parts are also very flat, and this has important results.

When rain falls on the ground some of it at once evaporates and goes back to the air, some runs off in drains or streams, some sinks into the ground and goes through holes, cracks and pores till it comes to a layer which is saturated so that it can hold no more. The upper

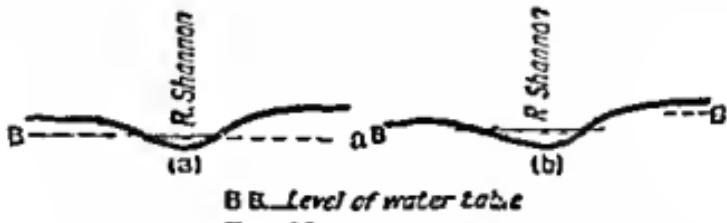


FIG. 80.—WATER TABLE.

A very little rise in the level of the water table causes flooding.

edge of this layer is called the *water table*. Now in Ireland the central plain of limestone is so low and so constantly deluged with rain that it is saturated with water nearly to the surface, in other words the water table is not deep down and the ground is, therefore, always moist.

peninsula of Kintyre, but this would entail a very long land journey from the lowlands right round Loch Long and Loch Fyne, and there is no railway there. The shortest available sea journey is further south.

In the south-west corner of Scotland, in the county of Wigtown, there is a large bay called Loch Ryan, and at the southern end of this opening, well sheltered from boisterous winds, is a small town, *Stranraer*. Almost opposite to the entrance to Loch Ryan there is, on the coast of Ireland, a town called *Larne*; the distance from Stranraer to Larne is only 35 miles. A quick way from Glasgow to Belfast is not direct by boat, but by train from Glasgow to Stranraer, thence by boat to Larne, and finally by rail from Larne to Belfast.

In the case of long sea journeys like those between England and America, there is less need to save an hour or two on the voyage. And the great passenger steamers, the ocean "liners," start not from mere ferry towns like Dover or Larne, but from the big ports; Liverpool, for instance, is a favourite point of departure for America. But even these lines call at "out" stations to land or pick up mails.

A few years ago the time-table for steamers between Stranraer and Larne seemed to offer an interesting puzzle.

TIME TABLE

GLASGOW AND BELFAST		THE	STRANRAER AND LARNE	
Glasgow	dep. 11 15 p.m.		Belfast	dep. 6 30 p.m.
Stranraer Harbour	arr. 5 47 a.m.		Carrickfergus	" 6.55 "
"	dep. 6 0 "		Larne Harbour	" 7 15 "
Larne Harbour	arr. 7 46 "		Stranraer Harbour	arr. 9 48 "
Carrickfergus	" 8 21 "		"	dep. 9 55 "
Belfast	" 8 35 "		Glasgow	arr. 12 30 a.m.

According to this time-table the boat that left Stranraer at six in the morning arrived at Larne at 7 46, that is, it took one hour and forty-six minutes. The return boat

There are limestone regions in England, but they form plateaus, as in parts of the Pennine moorlands. Being high up they are comparatively dry, for the rain sinks into cracks and caverns and is carried away by underground channels. The water table is far below the surface, and there are no streams except in the lower valleys.

In Ireland the limestone over which the waters flowed has been dissolved in many places. The ancient ice sheet left behind it thick layers of boulder clay that lined a number of hollows and prevented the water that collected there from draining away. As a consequence the Central Plain has a large number of shallow lakes like Lochs Ree and Derg, those into which the River Shannon spreads out. In the stagnant water of some of the lakes mosses and other bog plants flourished and every year the growth grew thicker. As one lot of moss died another grew on the top of it, and the mixture of moss and mud gave rise to a bog.

Some of the bogs are so hard that they can be crossed by men and animals, others, though they may look solid enough are soft and deep and would engulf any one who attempted to cross their treacherous surface. The largest of these bogs is the Bog of Allen between the basins of the Shannon, the Bawn and the Barrow.

The accumulation of dead moss on the floor of the hollows gives rise to peat. Peat is the chief fuel in Ireland, and as there is so much of it, the lack of coal is not so serious as would otherwise be the case. Nearly three-quarters of the Irish people use no other kind of fuel and in the bog lands cutting and drying peat are important occupations.

Commonly the peat is dug by a special spade in lumps a little larger than a brick. These are stacked together to dry, in groups of half a dozen, for some months before being taken home and stored.

Peat, when dried, is very absorbent and is used as a litter in cattle sheds. The fibres have been mixed with cotton and wool to form coarse cloths. Tar, oil, alcohol,

that left Larne at 7 15 arrived at Stranraer at 9 48 and so took two hours and thirty three minutes. As the speed of the steamer and the distance were the same both ways the time spent in the journey should surely have been the same both ways. The difference was not due to the west winds blowing the boat along for apparently it took longer to go with the west winds than against them, and it could not be due to the tides because the tides do not ebb and flow at the same time each day. As a matter of fact the boat actually took almost exactly the same time whichever way it went and yet there was no mistake in the time table.

The difference was due to nothing more than a difference in the clocks. The clocks in England and Scotland keep what is known as *Greenwich time* that is to say, when it is noon at Greenwich all the clocks in England and Scotland that are correct mark 12 o'clock. But the clocks in Ireland used not to keep Greenwich time that is they said it was 12 o'clock when it was noon at Dublin and the two times Dublin and Greenwich were not the same. When it was 12 by the Greenwich clock it was 5 minutes to 12 by the Dublin clock and when it was 12 by the Dublin clock it was 25 minutes past 12 by the Greenwich clock.

Suppose then that a man had left Stranraer at 12 Greenwich time and got to Larne in exactly two hours he would have found the Larne clocks saying not 2 but 25 minutes to 2. He would have appeared to have taken only 1 hour and 25 minutes over the journey. But if he had left Larne at 12 Dublin time and had arrived at Stranraer in exactly 2 hours he would have found the Stranraer clock saying 25 minutes past 2 and he would have appeared to have taken 2 hours and 25 minutes.

In another volume of this series it will be explained why different countries have different times and it must be added here that for the present Ireland keeps Greenwich time as 1 the differences noted above do not appear in the time table now in use.

and ammonia have been made from peat, and there have been attempts, not very successful, to use it in the manufacture of paper.

But the important production of Ireland is grass. The wetness of the land prevents the growth of fruit or wheat but not of oats, barley, and potatoes. The dampness and the mildness of the weather are favourable

to the growth of trees and grass. Ireland was once a forested country, but many of the trees have long since been cut down, and so the chief plant growth of modern Ireland is long luscious grass. It is this perpetually green carpet that has caused the country to receive the name of the "Emerald Isle."

Farming. — Grass grows so well in Ireland that it is unsuitable for sheep because they have such small mouths, the land also is much too wet for them. Cattle and horses, on



FIG. 81.—MAP TO SHOW WHERE THERE ARE MOST CATTLE.

the other hand have big mouths and can thrive in the luxuriant meadows and they do not suffer from living upon the damp ground. The particular kinds of farming then, for which the climate and soil render Ireland suitable are cattle rearing and horse rearing. The Irish are cattle farmers.

Ireland is one of the finest cattle breeding countries in the world. At one time men paid their rent, taxes, and

EXERCISE

On twelve little sketch maps plot the following times of sunrise at Wick, Yarmouth, Greenwich, and Valencia on the first of each month Then take the month of March. At Wick the sun rises at 7 11. At this hour it has risen at Yarmouth and Greenwich but not at Valencia. Estimate the point between Greenwich and Valencia where it is rising. Draw a line from Wick to this point. The sun will be rising at every point on this line. Shade all the area to the west. Do the same for each month. What do you notice? Can you explain what you notice?

	1st Jan	1st Feb	1st Mar	1st Apr	1st May	1st June	1st July	1st Aug	1st Sept	1st Oct	1st Nov	1st Dec.
Wick	9 5	8 21	7 11	6 42	4 20	3 17	3 11	4 3	5 13	6 19	7 30	8 38
Yarmouth	8 6	7 39	6 43	5 30	4 24	3 38	3 35	4 13	5 5	5 50	6 50	7 42
Greenwich	8 8	7 41	6 40	5 39	4 34	3 51	3 48	4 24	5 14	6 2	6 55	7 45
Valencia	8 51	8 25	7 31	6 19	5 13	4 29	4 26	5 3	5 54	6 43	7 37	8 29

other debts with cows, and "even at the opening of the sixteenth century we find the Earl of Kildare paying twenty cows as the price of a book."

Cattle are reared sometimes to be eaten and sometimes on account of their milk, either fresh or in the form of butter and cheese. The cattle that are intended to be eaten are reared first on the limestone plain where they are known as "store cattle," that is, cattle intended for killing. They are finally fattened for the butcher on the richer plains in the valley of the Lagan or west of Dublin, or they may even be exported to England and Scotland to be fattened in the lands where they will be consumed.

Dairy-farming is a very important occupation. It has been much encouraged by a system of co-operative farming. Early in the morning the bare-footed peasant women take the milk in a donkey cart to some small country town where a co-operative "creamery" has been established.

The quantity of milk is measured, the cream is separated and the skim milk is taken home again. The peasant is paid for the cream that his milk has yielded, and this cream, by means of machinery, is made into butter, chiefly for the English market. If it were not for the central "creamery" the peasant would be unable to find a constant purchaser for the cream. There are now over four hundred dairy societies with a membership of over 50,000 farmers.

The skim milk is taken home to feed the family and the pigs, so that the fine Irish hams and bacon must be counted as dairy products.

The People.—In the west of Ireland, where the soil is poorest and the weather wettest, live a number of peasants who resemble the crofters of Scotland, but they are even less comfortable. At the worst the cabins are of mud, the floor is a mixture of slime and mud mixed with the droppings of the fowls and pigs, there is no chimney, and the peat smoke blackens and befogs the atmosphere. The only furniture is a few boxes, a table,

CHAPTER XIII

IRELAND

WHAT kind of land is Ireland? Is it, too, different in scenery, climate, and occupation from those other parts of the British Isles to which we have already given our attention?

Coal—In the first place, Ireland has very little coal in comparison with the other parts of the British Isles. There are only two coalfields that are of any importance (i) the *Kilkenny* coalfield, in Kilkenny and Queen's County, which extends over 100 square miles, and (ii) the *Dungannon* coalfield in the county of Tyrone.

Once upon a time there was a great deal of coal in Ireland, but it lay on or near the surface, and in the millions of years that have elapsed since the coal period most of it has been worn away by the forces—ice, running water, and the weather—which everywhere do so much to fashion the face of the globe.

The mines that exist, unimportant as they are, would produce much more coal than they do if they were more deeply worked, and if there were better facilities for transport. The result of the lack of coal is that except in one area, to be mentioned later, there are no great industries, for modern manufactures are built on coal.

The Irish are, for the most part, farmers. We are already familiar with the fact that there are many different kinds of farmers, and that the particular kind of farming carried on in any given district depends, amongst other things, upon soil and climate. It will therefore be

and some bundles of straw and rotten cloth; the pigs and the chickens are as much at home there as the human inhabitants. Most of the farms are of course much better, especially those in the north and east.

As Ireland is an agricultural country the population is spread more evenly than it is in other parts of Britain. There are two areas, a smaller round Dublin and a larger round Belfast, where the population is comparatively dense, and there are parts of the boggy and mountainous districts where it is very scanty, but in the remainder of the country there is a more or less even distribution.

What towns there are inland are chiefly small market towns; the largest towns are the ports on the coast. But they are, with the exception of Dublin and Belfast, all small. There are only about ten towns with a population of over 10,000; of these Cork is the only one that would be considered a big town in England.

Ports.—Where are these ports? We have seen that the people of Ireland are farmers and produce butter and cheese, bacon and eggs. These are just the things which the people of Britain require, while other lands to the west and south, like America and France, do not require them. The people of Britain have a surplus of manufactured goods and these are required in Ireland. It is natural, then, that the trade of Ireland should be mainly with Britain and that the ports of Ireland should be on the east. The long inlets on the west would make splendid harbours but little is produced on the west and all that can be spared has to be sent eastwards, so those harbours are not of much use.

There are three important Irish ports corresponding to three important British ports, one each on the north and south and one in the centre of the east coast.

The seaway from Glasgow leads down the Clyde, through the Firth of Clyde and then to Belfast Lough, a long inlet into which flows the Lagan. At the point where the river meets the sea is *Belfast*, the largest town in Ireland. It has no local supplies of coal and iron, but coal can easily

be obtained from Ayrshire and iron from Lancashire. This has given rise to an important ship building industry. The yards of Messrs Harland and Wolff have built some of the largest of ocean liners and are famous all over the world.

Another important industry is the manufacture of linen. The flax plant, from which linen is made grows well in Ulster. It is a fibrous plant with a very thin stem. When it is ripe it is pulled up by the roots, and the seeds (linseed) are removed by means of a kind of comb. The stalks are then soaked in soft water for about a fortnight, after which they are removed and dried. They are then broken open by rolling and the fibres are separated from the woody core. These fibres are woven into yarn, which is spun into linen cloth.

It is said that Ireland could grow enough flax to supply all the linen factories of the United Kingdom, but, as a matter of fact much less is grown than the home factories require and there is a big import from Germany, Belgium, Holland and France, and a great deal used to come from Russia.

The manufacture of linen is centred in this part of Britain because the climate is moist and well suited for spinning and weaving flax, the water is well suited for bleaching and labour was cheaper, an important matter, for the finest linen of all is still woven by hand. The spinning and weaving of flax, like the spinning and weaving of cotton and wool was once a home industry, to day much of the finest weaving is confined to small towns, but the biggest factories are in Belfast.

Almost in the centre of the south coast is Cork, which trades with Bristol. It has a fine harbour forming part of the drowned valley of the Lee. In the neighbourhood are rich grazing lands with dairy farming as the chief occupation. Cork which is situated where the river meets the sea, makes preserves, cures ham and bacon, makes butter and exports large quantities of butter, cheese, bacon, poultry, and eggs to England.

are few great industries. Fishing affords an occupation to the dwellers by the coast, while catering for the needs of tourists, chiefly from the English Midlands and South Lancashire, is a very profitable enterprise.

South Wales Ports.—To understand the positions of these ports the following facts should be noticed. The surface of South Wales consists of two portions, the mountainous district in the north where the coal and iron are found and a plain to the south of it lying along the coast.

Down from the highlands come a number of rivers making for the sea. They have cut out the series of narrow, steep-sided valleys which have been referred to and which have always been the natural roadways down to the coast. Now it will be noticed that

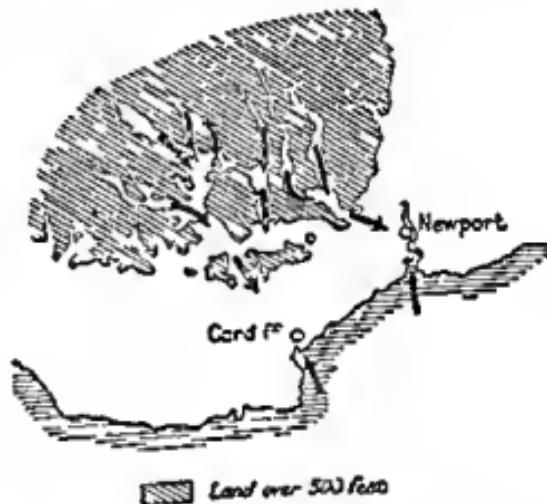


FIG. 86.—MAP TO SHOW THE VALLEY ROUTES THAT LEAD DOWN TO CARDIFF AND NEWPORT

these valleys run either south-eastwards or south-westwards and gather into two estuaries on the east and Swansea Bay on the west. These are naturally important sites. Long before coal was mined the heads of these estuaries were the sites of small ports. They were important sites also as being places where the south coast road crossed the river on bridges protected by fortifications. On the Usk was Caerleon, on the Taff was Caertraff. With the growth of coal mining they have developed into ports for exporting coal. On the east Caertraff became Cardiff, and Newport grew beside Caerleon, Cardiff being the greater because of its deeper water. In a similar

In the harbour there is a small island on which stands Queenstown, a port of call for the great mail steamers crossing the Atlantic.

Dublin piers with Liverpool. It is at the head of Dublin Lough where the Liffey enters the sea. The estuary is not large but, by means of it, goods can be taken farther inland than by means of any other estuary on the east coast.

Dublin is at the edge of the great plain and in the



— Roads ■ Land over 400 feet
FIG. 82.—MAP TO SHOW THE POSITION OF DUBLIN.

driest and most fertile part of it. Its position in the centre of the east coast on the edge of the plain opposite Lancashire, at the head of an estuary, and at the lowest point where the Liffey could be bridged has made it both port and market.

To north and south are two smaller ports.

Waterford exports the agricultural produce of the south east of Ireland as Cork exports that of the south west. It has a fine harbour which forms the outlet for the rich, fertile valleys of the Barrow, the Nore, and the

way Swansea has gathered together the export trade of the western valleys

Cardiff is situated on the narrow coastal plain and was given a castle, even before Norman times, to close one of the doors from Wales into England. It is at the mouth of the Taff, that is, at the mouth of a valley leading to the richest iron and coal area in the district. The mouth was big enough for the small ships of earlier times, but not for the larger vessels that now carry on the commerce of the world. To meet the requirements of these vessels, big docks have been built that are provided with five miles of quays. The trains that carry the coal to the docks run downhill with their loads and uphill with the empties, this means an economy of steam power.

In the older docks the wagons run on to a turn-table, force down a cradle at one end and tip their contents down a shoot into the hold of the vessel. In the newer docks the coal slides into a box which holds a full wagon load. This box is hoisted by means of a crane and then lowered into the hold of the vessel, where it is emptied. By this method less of the big coal is broken up into small pieces, and there is less trouble in trimming. In some places the coal wagon is hoisted bodily sixty feet above the quay and the coal sent down a shoot so steep that there is no need to employ any labour in keeping the shoot clear.

At the beginning of the nineteenth century Cardiff was only a village, and as late as 1840 one could have visited all the houses in a single morning. A year later it began to grow, and in 1921 it had a population of 200,262. This rapid growth is due to the working of the coalfield and the establishment upon it of industries that need huge quantities of coal, e.g. smelting ores.

Newport is near the mouth of the Usk and on the coastal plain and, like Cardiff, once possessed a castle*. It was so small in 1801 that only one post woman was needed to deliver all the letters. Then coal began to be worked

* Still exists.

Suir. Its industries and exports are like those of Limerick and Cork.

Londonderry is the port of the north coast and has steamer connections with Glasgow and Liverpool. It is the outlet for the valley of the Foyle and its tributaries. It once shared in the linen trade of Belfast, but this has now given way to the manufacture of shirts. Large steamers make use of Moville at the entrance to Lough Foyle, although most vessels can reach Londonderry itself if desired.

Limerick.—Limerick is the largest port on the west, but it is little better than a village. It is at the head of the estuary of the Shannon and at the lowest point where a bridge could be built. Leading towards this junction of sea and river route, are several valley routes that help to make Limerick the natural market for the district. South of Limerick lies the richest grazing ground in Ireland; cattle raising and dairying are important. The industries of such a place are the making of farm machinery and leather, curing bacon, making butter.

Then there is *Galway* on Galway Bay, which has a fine harbour and, in the Aran Island, a natural breakwater, but it is quite small. If there were a tunnel under the Irish Sea (and such a thing has been proposed) trains could run direct to Galway and considerably shorten the sea route to America. In such a case Galway might become important. Ireland would become a kind of peninsula, and Galway would become a packet station.

Packet Stations.—The packet stations at present are of course on the east like the ports.

Belfast, Dublin, and Cork are chief ports, placed as far inland as possible, one on the north, one on the south, and one in the centre; the packet stations must be as far out as possible. Of these we have already mentioned Larne and its connection with Stranraer.

In the south-east corner of Ireland is Wexford Harbour with its mouth blocked by sand. An artificial harbour at Rosslare has replaced it, and from here packet steamers run to *Fishguard* right out at the south-west corner of Wales.

and ironworks to be set up and prosperity commenced. The place is a focus of railways from Glamorganshire and Monmouthshire and it has large docks, though not so large as those of Cardiff. Before the construction of these docks the only accommodation for shipping was provided by the estuary of the Usk.

In 1912, in a list of British coal exporting ports Cardiff stood first and Newport third.

Swansea, at the mouth of the Tawe, and where the western valleys converge, is one of the most ancient harbours in Britain, but before it was artificially improved, vessels of quite small tonnage lay aground at low water. To protect the harbour from pirates a castle was built. At one time the river ran into the sea by several shifting channels, then the harbour mouth was narrowed and breakwater piers were built. This had the effect of bringing the shifting channels to a common outlet and creating a fairly big tidal harbour. Mumbles Head, a high cliff to the west, protected the waters from westerly storms. At the time when the piers were made, coal and other minerals were brought to port on the backs of ponies.

At one time there were flourishing mines of copper and tin in Cornwall and Devon. There was no coal there and the ores were sent away to be smelted. The nearest big coalfield was that in South Wales, which in consequence smelts copper and tin in a number of the coast towns.

The chief metal smelting centre is Swansea. Very little ore is now obtained from Cornwall and Devon but other mines all over the world help to keep the Swansea furnaces going.

In the Swansea district the tin is largely used for plating tin, that is for covering iron plates with a thin coating of tin, this coating prevents the iron rusting. The so called "tin" cans in which food is preserved are not of tin but of this tin plate, pure tin would not be stiff enough and would be very expensive.

The packet station for Dublin is Kingstown, which



Fig. 53

is connected, by frequent steamers, with Holyhead right out at the north-west corner of Wales. Here it is not

Reservoirs.—Wales has another raw material to sell—

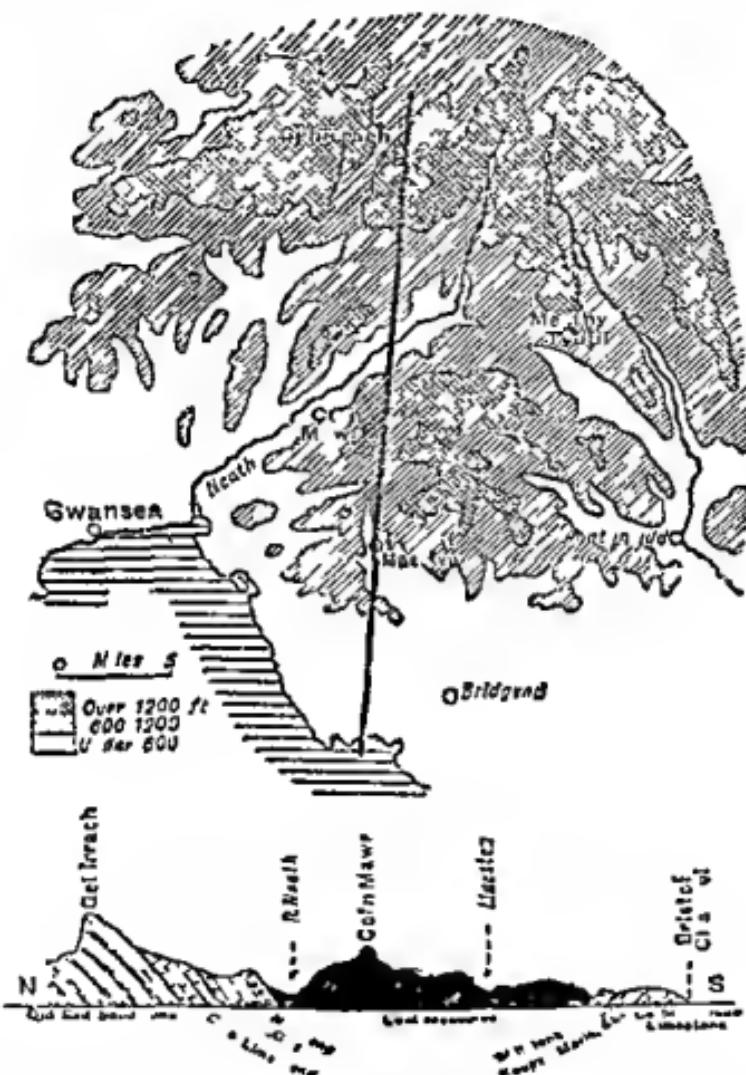


FIG. 87.—RELIEF AND SECTION OF SOUTH WALES COALFIELD

This section like that of Fig. 40 shows not only the outline of the surface but what is below the surface.

water. There is abundance of rain in this wet west land. The region round Snowdon shares with the north west

possible for a port to be far inland nor for a packet station to be far out. The distance between Dublin and Kingstown is only a few miles, but the few miles make all the difference between a port and a packet station.

The Capital.—Dublin is something more than a port or a market. Dublin is at the centre of things, here meet roads, railways, and canals from north, south, and west and sea roads from the east. It is the natural place for the seat of government, and it has been the capital of Ireland ever since Ireland has been ruled as one country. As the capital it is the seat of law courts, bank and university. Just as the capital of Scotland is where the chief route entered the country, so Dublin is where the chief route enters Ireland.

EXERCISES

1. Draw the temperature graph for Blackrod Point in the west of Ireland (Appendix). How does it compare with that of other graphs you have drawn? What conclusions do you draw?

2. Copy Fig. 83. This shows the temperature for 7 a.m. on May 8, 1914. Notice which places have a temperature over 47° F. and those which have a temperature less than 47° . Underline each of the former. Draw a line to separate the places with a temperature over 47° from the rest. (This line is called the *isotherm of 47° F.*) Compare this with Fig. 78. Which are the warm winds and which are the cold winds? Note where the rain is falling. Refer to p. 169 and say why.

3. Draw a map of the west coast of Great Britain from Glasgow to the Bristol Channel and of the east and south coasts of Ireland. Shade the land. Mark the packet stations and ports. Join each packet station or port in Great Britain with the corresponding one in Ireland. Measure the distance between each pair.

Highlands of Scotland and a part of the English Lake District the distinction of being one of the few spots in Europe with a rainfall averaging over one hundred inches per annum. The water mostly runs away in the short rapid rivers. But at several places the river valleys have been dammed and the water thus collected is conveyed by means of pipes to towns far away *

Thus Liverpool gets its water from Lake Vyrnwy. In 1888 a dam was built across the lower end of what was then a boggy valley (in the Berwyn Range) threaded by a sluggish brook. The dam is 1,200 feet long, 100 feet high, and holds back 12,000,000,000 gallons. The distance from the reservoir to Liverpool is about seventy miles.

Birmingham gets water from the valleys of the Elan and Claerwen (tributaries of the Wye), a distance of seventy-nine miles.

The Mountains and History.—Wales for many centuries was a land of refuge. As each new wave of invaders came into Britain they mingled with the occupants of the fertile east and tended to leave alone the inhabitants of the less fertile but securer west.

It would have been difficult, in such a mountainous country, either to beat the people in actual battle, or to conquer them by settling in their midst. In their mountain fortresses the Welsh lived by themselves and to themselves, and through all the centuries they have managed to preserve a distinct language. Where the land is flat, as in Anglesea or Pembroke, Englishmen intruded and settled. But elsewhere there are few people other than the Welsh. It is the mountains that have helped Wales to be so independent; but they have done something else which is not quite such an advantage.

Each of the earlier tribes lived in its own valley, separated from the rest by mountain and moor. In these valleys each tribe remained free and independent of the others. There was no union amongst them and

* For an account of the distribution of water, see *Gateways of Commerce*, Fairgrieve and Young, Philip and Son.

CHAPTER XIV

WALES AND ITS BORDERS

THE previous chapter has introduced us to two packet stations in Wales, where the land projects far westwards on the north and south, there are no others, and there are no great ports for goods. Goods go by sea to the north and the south but not to Wales, it is too much of a peninsula. It thrusts itself out into the western seas and such a position, though suitable for packet stations, is unsuitable for ports unless the land is very populous and productive.

What kind of land then is Wales?

Relief and Routes.—In some respects Wales resembles Scotland, as it is mostly high, but there is nothing to correspond to the Central Lowland. It differs very much from Ireland, for it possesses no central plain and its high land is compact and not split up into a number of small groups. It is a land of moors and mountains in whose hollows lie a number of small but very beautiful lakes and tarns, down whose sides dash hundreds of foaming torrents, and on whose summits the clouds gather hour by hour during many days of the year.

The mountains and the moors are something like the Southern Uplands of Scotland except in the north west, which is rather like Cumberland, for the reason that the layers of rock in each are much tilted.

The mountains of Wales are, like the mountains of Scotland and of the Lake District, the remains of a plateau of ancient bent and eroded rocks, and have been cut

when the country was conquered it could be conquered bit by bit.

There is no natural centre to Wales, as there is to England, Scotland, and Ireland, from which it could be governed, so that it never had a capital and it was never a



FIG. 83.—MAP TO SHOW THE ROADS FROM THE WEST TO CHESTER, SHREWSBURY, AND GLOUCESTER.

more important of the two, and it was guarded by *Chester*, i.e. the camp. It was at the end of the great Roman main road Watling Street, and it is so situated that it defended the road to Ireland through North Wales and the road to Scotland through north west England.

kingdom. The valleys into it from England—the *Dee*, *Wye*, and *Ush*—lead upwards to uninhabited regions separated from each other by areas that it is difficult to cross. Furthermore, the country is divided into two by the valleys of the *Dovey* and the *Severn*.

The Romans made roads where the main modern railways run, that is along the north and south coastal plains, and they built forts, the chief of which were *Chester* in the north, *Shrewsbury* in the centre, and *Gloucester* in the south.

The Normans depended less on roads and armies but erected more and more castles. *Chester*, *Shrewsbury*, *Gloucester*, *Worcester*, *Hereford*, and *Bristol* as well as many places farther west, had new strong stone castles with men of great bravery to defend them.

Chester—As already noted there were two main roads into Wales, one in the north and one in the south. Between them lay the valley of the *Severn*. The north road was the

out of that plateau by the action of the rivers. The loftiest and most picturesque part is in the north west, where the highest point is Snowdon. This district affords us abundant evidence of the presence of glaciers at a former epoch. The rocks are often polished by the ice that was pushed over them or scratched by the stones that were embedded in the ice block.

There are numerous boulders called erratics big blocks of stone belonging to other districts these could not have reached their present positions upon the slopes of the Welsh mountains unless they had been transported there by ice. There are also lakes as at Bala where the mouths of the valleys have been dammed by moraines as in the Lake District and there are others mostly small, that lie in basins that were dug out by the glaciers.

In so mountainous a country as Wales the construction of roads and railways is neither easy nor cheap. There are along the north and south coasts however narrow strips of low land where roads and railways have been made without undue difficulty or expense. From London to Scotland there is a choice of two routes one to the east and the other to the west with the high moorlands of the Pennines in between. From London to Ireland there is also a choice of two routes one on the north and the other on the south with the high land of Wales in between.

Of these two roads that along the north coast and through Anglesea to Holyhead was the more important because it was the more central for Ireland. Between Anglesea and the mainland are the narrow Menai Straits crossed by two bridges a suspension bridge for road traffic and the Britannia Tubular Bridge which carries the railway. Anglesea is connected with Holy Island by means of an embankment.

The road on the south has increased greatly in importance in the last century partly owing to an increasing use of the southerly route to Ireland and partly because of the growth of towns in the South Wales coalfield. This is now the route of the Great Western Railway to

The fort was built on a low hill above the River Dee, and the town was walled round by the Romans, almost the whole of this wall, either original or restored, still remains. Chester was formerly at the head of navigation of the Dee, and the waters of the river, now a furlong away, washed the walls of the city at one point. But the Dee estuary is shaped like a wide funnel and allowed the waters of the river to spread out so that their speed was checked, their load of mud deposited, and the estuary silted up. Any importance that Chester once possessed as a port has departed. But just as it was once a notable road centre so it is now a famous railway junction. Six main and many minor lines of railway meet at this point.

The surrounding country, the plain of Cheshire, is fertile and, as it lies in the west, it has plenty of rain. Hence we get grass, cattle, and "Cheshire" cheese. As there is a very large population in South Lancashire, much of the plain is devoted to market gardening, vegetables, strawberries, etc., find a ready market quite close at hand.

Gloucester — The southern way into Wales naturally passes Gloucester. It is the lowest point at which the river could be bridged and is in the centre of a fertile area. Its central position has made it both market town and county town and, like so many other similar ancient cities, it possesses a cathedral.

The Severn, from the map, appears to afford an excellent highway into England and Gloucester, at the head of the estuary, and near the thickly populated coalfields of the Midlands, might have been expected to be a large and ever growing port, in reality it has a population of only 51,330.

The smallness of the town is due to certain disadvantages in the Severn estuary. The estuary suffers from a tidal bore (see p 88) which is a great hindrance to the navigation of big vessels, and whose effects are particularly troublesome at Gloucester, and even the

Fishguard and Milford Haven. At one time the line went round the north end of the estuary of the Severn, but now a tunnel four and a half miles in length has been made under the estuary and the journey shortened by over fifty miles.

Occupations.—*Sheep farming*—So much of the land is high that the meadows are fewer and poorer than in Ireland

even though there is abundance of rain, and hence there is little cattle rearing or dairy farming except on the coastal plains and in the flat island of Anglesea. This island has, for its area, more cattle than any other county in England and Wales. The country is too wet for wheat or fruit, though, as in Ireland, oats and barley can be grown.

But on the mountains, and especially on the steep mountain sides where the water runs off quickly, there is plenty of that short fine grass that suits



FIG. 84.—MAP SHOWING WHERE THERE ARE MOST SHEEP

sheep, so that many of the Welsh are sheep-farmers; this was more especially the case before the opening of the coal mines and the coming of the industries that are centred upon them.

The sheep are reared chiefly on the drier eastern slopes as is the case in the Pennine Moorlands and the Southern Uplands, it is therefore the drier east from which comes Welsh mutton and Welsh flannel.

construction of a canal has not improved matters while the chief route to South Wales is now by the Severn Tunnel and so avoids the city.

Shrewsbury—Shrewsbury is on the road into the centre of Wales by means of the valley of the Severn. The Severn rises in Plinlimmon, about fifteen miles from the Irish Sea, but flows north east and leaves the mountains of Wales to enter the plain of Shropshire. At one point in the Shropshire plain the river makes a bend like a horseshoe and encloses an area of high ground. On the high ground inside the horseshoe a fortress was built and here is the ancient town of Shrewsbury, whose beginnings go back to the days of the early Britons.

Here meet a north and south road between Bristol and Liverpool, an east and west road between Birmingham and Wales and a host of roads connecting with the chief places in the west of the Midlands. It is naturally a market town and railway junction. It is centrally situated in the plain and is equally naturally the county town.

All these big towns are outside Wales, in the border land and, in the absence of a natural centre in Wales itself, one of them Shrewsbury is so centrally situated with regard to Wales that it has been found a more convenient meeting place for Welshmen than any town in their own country. And London also, which is connected by fast trains with all parts of Wales, is frequently chosen as a common meeting ground when Welshmen desire a conference. In a very real sense London is the capital of Wales—for it is more convenient for men from all over Wales to meet there than in any one place in Wales itself. But population is growing in South Wales and Cardiff, with its docks, railways, industries and magnificent public buildings is becoming more and more the important place in Wales. It is not central, but while most of Wales remains thinly inhabited, many people are living in the south and Cardiff is becoming the centre of the people.

Wales, too, offers us other examples of that transhumance, the movement of animals from one district to another with the season, that was referred to in Chapter II. In the summer the flocks move from the lowlands on the coast to the pastures on the mountains, in the winter they return. The summer and winter pastures are often twelve to fifteen miles apart. Then, too, yearling sheep are often sent from inland to coastal districts for the winter, as the climate is more genial and the pastures are better down by the sea. The journeys in this case may be anything from thirty to seventy five miles, though when the distance is great the sheep are often moved by rail.

Slate Mining—Slate is mud that has hardened and then been subjected to great pressure so that it can be split into thin plates. It is this quality which gives slate its special value as a form of roofing for houses.

There is a great deal of slate in North Wales, but most of it is of no use for roofing for it may be bent or have grit in it. The same pressure that made it possible to split the slate has also bent it, and in that case it is obviously unsuited for roofing. It is only fine mud that splits under pressure, so that the presence of grit prevents the development of slaty structure. Still North Wales is our chief source of supply, and in 1912 it produced more than three quarters of all the slate quarried in the United Kingdom.

Coal Mining—Coal is usually found associated with hills. We have seen that in Scotland the coalfields lie along the edges of the central plain in Fife and on the Firth of Forth, in Lanark and in Ayr. In England the majority of them are connected with the Pennine moorlands. On the edges of the Welsh highlands there are coalfields in Flint, in the valley of the Severn, the Forest of Dean and in Pembroke, while the biggest and most important of all is in South Wales in the valleys of Glamorganshire.

The coal of South Wales differs in two respects from

EXERCISES

1 Copy the map showing most sheep in Britain (Fig. 84) and that showing most cattle (Fig. 81) on to the same map. What do you notice?

2 Make a map of Wales to show the counties. Below are given the number of square miles in each county and the population. Find the number of people per square mile in each county. Cover all over with black those that have more than 300 people per square mile. Shade with lines  those that have between 100 and 300 people per square mile. Leave unshaded those that have fewer than 100 per square mile. Give a title to the map. What do you notice? Explain what you notice. Why would you get a more satisfactory map by taking parishes instead of counties?

WALES.

County.	Area in sq. miles	Population ¹⁹²¹
Anglesey	276	51 693
Brecknock	733	61 257
Cardigan	692	61 202
Carmarthen	919	175 069
Carnarvon	572	131 034
Denbigh	663	154 847
Flint	256	106 468
Glamorgan	813	1 252 701
Merioneth	660	43 450
Montgomery	797	61 317
Pembroke	614	92 050
Radnor	463	23 528

3 From Fig. 18 showing erratics make a map showing by arrows how they came from Crifel, Buttermere and Shap. What conclusions can you draw as to the direction in which the ice was moving?

that mined elsewhere in Britain. It lies in a more mountainous region than other coalfields. The valleys are exceedingly deep as well as narrow—the result is that the seams of coal come to the surface in the sides of the valleys and the coal may be obtained more easily than if shafts had to be sunk through all the overlying rock.



FIG. 65—COALFIELDS OF SOUTH WALES

part of the South Wales coal is of a somewhat different kind from the rest of British coal. It is *anthracite* which gives great heat with little smoke, and so is suitable for factories and for the navy.

Iron Mining.—There has been a great deal of good iron ore on the South Wales Coalfield. But this is now nearly all worked out and much Spanish iron ore is imported. The older furnaces were twenty miles or more from the coast at Merthyr Tydfil and the imported ore had to be carried that distance by rail. To save the expense of rail carriage huge blast furnaces have been erected at Cardiff and other ports. There the ore can now be taken direct from ship to furnace.

But just as cotton is still landed in large quantities at Liverpool though there is a water route to Manchester, because men have been used to landing it at Liverpool so some of the foreign ores sent to South Wales to be smelted still go to the old iron towns, even though very little iron is now mined near them.

With the exception of sheep farming, and mining there

Each valley in the coal area is one long narrow town with a dirty stream at the bottom, a railway, or perhaps two and a main road while side roads climb steeply up the hillsides. A thousand feet above are the moorlands.

A considerable

CHAPTER XV

COUNTIES OF THE SOUTH WEST

In the south west of Great Britain there is a long narrow peninsula containing the counties of Devon, Cornwall, Dorset, and Somerset

The peninsula has considerable variety of scenery, as it includes high moor land, deep valleys a large plain and a number of small ones, it has also a long sea coast with many inlets. The widest stretches of high land in Cornwall and Devon are Bodmin Moor, Dartmoor and Exmoor, while in Somerset there is the limestone tableland of the Mendip Hills.

Relief—*Bodmin Moor* is a rounded granite hump in Cornwall. It is part of that long stretch of high land often called the Cornish Heights which ends in the rugged rocks of Land's End the most westerly point in England. Though mainly of granite it contains slate and other kinds of rock.

Dartmoor is the highest of the south western moorlands. It has been described as a highland of granite rising out of a sea of slate. It measures about twenty-two miles from north to south and twenty from east to west. There is some doubt as to the way in which the granite bosses in this part of the world were formed, but it is probable that they are the stumps of mighty volcanoes worn down through many centuries into their present form.

The higher points of the moorlands are called *tors*, and are just bare rock on which nothing at all will grow.

Under the action of the weather the granite tors break up into big rectangular blocks that suggest masses of masonry piled up by a race of giants.

On Dartmoor it is possible to walk for miles and never see a house just as in the Pennines and the Scottish highlands. But Dartmoor is smaller than either of these. There are few trees, and even the grass is, in places quite scanty. Here and there are soft bogs in which it



FIG. 89.—SOUTH WEST OF ENGLAND

is possible to sink so deeply as to be overwhelmed. There are of course few people and the loneliness and wildness of the more barren parts have given rise to stories of pixies who haunt the moorland, drink the farmer's cider, ride his horses and lead travellers into the bogs.

Exmoor is an upland not of granite but of sandstone from which one can look out over the Bristol Channel. It is a wild open moorland with few fields or trees though,

drowned valleys form estuaries. On the latter Plymouth began as a fishing village, became a market town and a port of departure for America. When the Channel was more easily navigated by fast sailing vessels and by steamships Plymouth and the other little western ports lost a good deal of their importance, but ships between America and England still sometimes call at Plymouth and land mails, as several hours are thus saved in reaching London. A few passengers also take the opportunity of landing, for there are two railway lines, the Great Western and the London and South Western, one round the south of Dartmoor and the other round the north. But it has not been worth while to build large docks and warehouses.

On the Tamar the docks of Devonport were constructed during the French wars; it is a naval station, that is a place where gunboats, torpedo boats, battleships, and other warships are built, repaired, and kept in readiness for action. It is the station from which they may proceed to patrol the entrances to the Channel and the Irish Sea.

Between Plymouth and Devonport, on a little bay, is Stonehouse. Each of the three has attracted so many inhabitants that they form one town, the largest in the peninsula proper.

We should not indeed expect to find a large *port* in this peninsula, for ports are as far inland as possible, and therefore not usually to be found at the ends of peninsulas. But there is one big port in the south west

Bristol

Bristol, however, like all good ports, keeps to the rule that it is as far inland as possible. It is not on the broad estuary of the Severn, but up a side street, the estuary of the Avon. The position of Bristol, a more ancient port than Liverpool, is worth examining at length.

If we follow the valley of the Bristol Avon eastwards, it will lead us up to and through the Cotteswold Hills, after that we can, without much climbing, pass into the

on the edges, there are deep, narrow valleys noisy with flashing streams and crowded with trees. It is a land of bracken, heather, and grass. Like the other moorlands it is not suitable for cultivation, and as there is little for sale there are few towns or villages. Its animal life includes the red deer running wild, a breed of small hardy ponies, and some sheep.

The Mendip Hills are a plateau of limestone of the

same kind as occurs in the Pennines. Here, as in the limestone districts of the north, great caverns are found formed by the action of rain water on the soluble rock. In one place the roof of what was once an enormous underground cavern has fallen in and left us with the Cheddar Gorge, perhaps the most striking example of this kind of scenery in the British Isles.



FIG. 90.—THE PLAIN OF SOMERSET

Identify this area on a map of England. At one time all the shaded area was marsh.

Between the limestone of the Mendips and the sandstone of the Quantocks there is a great stretch of low lying land which in early times was marshy, unhealthy, and practically uninhabited.

This plain, Sedgemoor, resembles the eastern Fen Land, inasmuch as it is low lying and built of alluvium, but it differs from the Fen Land in containing more peat. Moreover, the little islands of dry land which once were real islands in a shallow sea, are not low and clayey as

Sedgemoor—Between the limestone of the Mendips and

valley of the Kennet, and so into the valley of the Thames and to London. There is, therefore, an easy west to east route in the south of England with London at the eastern end. Before coal became so widely used, the south east of England was the most important part of the country, and a long road from the west leading to it was sure to be frequented, and somewhere near its western end there was likely to be a town.

Next, we see that persons travelling from the south west of England towards the Midlands or the north would have to cross the Avon somewhere, that is, there



FIG. 91.—MAP TO SHOW THE POSITION OF BRISTOL.

had to be a place where a road north and south crossed the road east and west. It would, of course, cross by means of a bridge, and that bridge was placed at the head of navigation of the estuary.

At the point where the roads from north, south, and east met the sea and river roads from the west, that is at the bridge,

it was convenient for men to live, and even in early days the Avon was frequented by ships from Ireland and France that came thus far and could get no farther. The town was called Brig stowe, or "bridge place," a name since changed into Bristol. Bristol is therefore a bridge town like Newcastle and Stirling. It was also a port, and for several centuries, when the north was of little importance, Bristol was second only to London in trade and population.

As the port was open to the west it was from Bristol that Cabot and his sons set sail in 1497 on that voyage

they are in the east, but often fairly high steep sided hills

Legend has it that it was to one of these hills, Glastonbury Tor, on the Isle of Avalon, that King Arthur went to die and that it was in the Isle of Athelney that King Alfred took refuge from the Danes

To day Sedgemoor is drained by a network of canals. The sedges that gave it its name, and which indicate a difference between the vegetation of this low lying moor and the heather or grass of the highland moors, have disappeared from hundreds of acres where they once grew rankly. The thick masses of vegetation have decayed to form humus, one of the most important constituents of fertile soil, so that Sedgemoor, like the Fen Land, is now much more productive than it was.

Between Exmoor and Dartmoor there is a lowland sometimes called the Plain of Devon. It is not really a plain, for the surface is uneven. Similar though smaller lowlands are found round the coast. These, even if of no great extent, are yet places where people may live.

Climate.—The peninsula gets its full share of the damp westerly winds, and these deposit a plentiful supply of moisture as they rise to pass over the higher ground, the highest part of Bodmin Moor has a mean annual rainfall of from 60 to 80 inches or more. This should be compared with the 25 or 26 inches which make up the mean annual rainfall of an eastern town like Lowestoft.

The presence of the sea also tends to make the winter mild and the summer cool, and this effect of the sea is all the greater because of the long seaboard caused by the presence of so many inlets. Then it must be noted that this part of England is the furthest removed from the continent of Europe, and that it lies well within the area of the Gulf of Winter Warmth. It is not surprising that under these circumstances the climate is the most equable in England.

But if the climate is rainy, it is also one of the sunniest.

of discovery that gave us Newfoundland. The discovery of America by Columbus and others opened up trade in cocoa, sugar, and tobacco, the nearest British port to America was Bristol, and hence that port was early associated with the trade in these commodities. At the end of the seventeenth century "the passion for colonial traffic was so strong that there was scarcely a small shopkeeper in Bristol who had not a venture on board of some ship bound for Virginia or the Antilles." Thus trade it still retains, it also prepares the raw material for use, and so has tobacco factories, cocoa and chocolate works, and sugar refineries. Its position with regard to Ireland, as pointed out in the last chapter, has made it the chief port for receiving the dairy produce of the Emerald Isle.

In recent years the banana and other fruits of Central America and the West Indies have been coming to us in ever increasing quantities, and as Bristol has so long been associated with the trade of these parts of the world it is not surprising that the port plays an important part in the distribution of fruit.

The huge slups of to day would find it difficult, and in some cases impossible, to reach Bristol. The Avon is narrow, and there is a very considerable rise and fall of the tide. So new docks have been built nearer the mouth of the river, chiefly at *Avonmouth*, it is at Avonmouth, rather than Bristol, that the perishable fruit is landed. This fruit is despatched as soon as possible, by fast trains, to the London market.

Bristol stands on the edge of a small coalfield which supplies a great deal of the fuel used by the ships in the harbour and the factories on land. The coalfield possesses no special industry, like the cotton of Lancashire and the woollen of Yorkshire, and its only big town is Bristol, which, as we have seen, does not owe its importance to the nearness of coal.

There are, in the peninsula, other kinds of towns and villages that are suitably placed with the sea round them.

in the British Isles. All these things have important results.

What the People do.—The south-west peninsula resembles Ireland in being mild and wet and, though the high lands are barren, the valleys, through each of which a little stream trickles to the sea, are wonderfully fertile. In these valleys stand numerous picturesque villages with thatched cottages and, between the villages, especially in Devonshire, are steep, narrow, winding lanes, with high banks and high hedges which, in the spring, are full of fragrant flowers.

Farming.—The mildness and the wetness produce rich juicy grass, on which, as in Ireland, cattle are reared. We have seen that sheep thrive best where it is dry underfoot. Cattle, on the other hand, are most profitable where the grass is long and juicy and where it grows all the year round. This is true of the greater part of Ireland, but all the lowlands of the west share in the advantages. Ayrshire is the dairy of Scotland. In Anglesea and Pembroke are many cattle. In the south-west of England there are naturally many dairy farms, and "Devonshire" butter and cheese have a high reputation, while Cheddar cheese is made from milk of cows fed on the grass lands of Somerset. This cheese was famous at least four hundred years ago, and it is recorded that some of the cheeses of an earlier date were so large that it took two men to put one on the table.

Cornwall stands fourth amongst cattle-raising counties, and even Devonshire takes a high place, despite the amount of high and unfetile country that the county contains.

In the drier valleys on the east there are many fruit orchards, virgin white in spring and mellow red in autumn. They are to be found in Devon, Dorset, and Somerset, and then, farther north, on the lee side of the Welsh hills in Gloucester, Hereford, and Worcester. Here there is a total of 20,000,000 apple-trees alone.

From the apples cider is made, and "Devonshire cider" is a well-known beverage.

Every summer thousands of people go to the seaside for a holiday, although they spend much time in cinemas they possess a desire for fresh air, and almost the first thing to be accomplished by the latest arrival is to go to the end of the pier "for a blow". The place where one can get the most sea air is at the end of the pier. This suggests that *seaside resorts*, like ferry towns and fishing towns, are as far out as possible. And, in fact, most fishing towns and ferry towns are tourist centres as well.

But note, seaside resorts do not need harbours as fishing towns and ferry towns do, and they can therefore be much farther out, right at the ends of peninsulas and capes. The south-west peninsula is a famous summer playground with its fine rocks, great waves, wooded glens, mild air and sunshine, firm sands, and excellent bathing. And right out, at the very end of things, are *Ilfracombe*, *Newquay*, *St Ives*, and other well known resorts.

In other parts of the country the same kind of rule holds, as may be seen if we note the position of *Scarborough* in Yorkshire, *Leicester* in Suffolk, *Margate* and *Ramsgate* in Kent, *Eastbourne* in Sussex, and so on. Most of these places have the advantage, too, of having more than the normal amount of sunshine.

As railway travelling is expensive the busiest seaside resorts are nearest to the big towns where many people live. To save the cost and fatigue of a long railway journey Yorkshire people go to *Scarborough* or *Whitby*, Londoners to *Margate*, *Leicester*, and *Brighton* (the first of seaside resorts), Lancashire folk to *Blackpool*, North Wales, and the *Isle of Man*, while Bristol people flock to *Somerset*, *Cornwall*, and *Devon*.

The south west peninsula it is evident, is a place of much interest and beauty. Inland, on the moors and plains, or in the valleys there are a few miners, quarrymen, and farmers, the latter keep sheep and cattle and sell cream and butter and cheese in little market towns.

On the east side of Exmoor, between the Quantock and the Blackdown Hills, is the *Vale of Taunton*. This is so sheltered as to be dry enough to allow wheat to be grown, but, on the whole, the south west peninsula is too wet for wheat, and farmers do not grow it.

Sheep can be reared on most of the hill sides. Their wool is used at *Axminster* in the manufacture of carpets.

Mining—The south west peninsula was long famous for its minerals. Chief amongst these was *tin* in the Cornish Heights. We are told that as far back as 4000 years ago, people came from the eastern Mediterranean to buy tin, and Cornwall was, for centuries, the chief tin producing country of the world. Many of the mines have been worked out, and more cheaply mined ores have been found elsewhere, so that the tin mining industry in Cornwall, though still carried on, is not as important as it once was.

The *copper* mines of Devon have also been given up, but *lead*, which was obtained from the Mendips as early as the time of the Romans, is still worked. *Granite* is quarried for building purposes, and *slate* for roofs, but the slates of Cornwall are not so valuable as those of Wales.

The most important mineral in the peninsula, with the possible exception of *coal*, near Bristol, is *china clay*. We have said that much of the highland is of granite. Now granite, hard as it is to the chisel, can be broken up by the weather into its constituent materials and one of them converted into clay. The clay is most abundant along the southern edge of the high land, where, in some way not well understood, it appears to have been washed together into great beds. "In 1855 the output of china clay and china stone from Cornwall was 80 000 tons, in 1904 the output was 850 000 tons. About one third of the quantity is used in the Potteries, of the remainder, some is sent to Manchester for the stiffening and bleaching of calico, some to Paris, where it is put into confectionery, and some to the United States, where it is used for artificial teeth. It is also used in

or despatch them by rail to other parts of England. On the coasts are fishermen, sailors, lodging-house keepers,

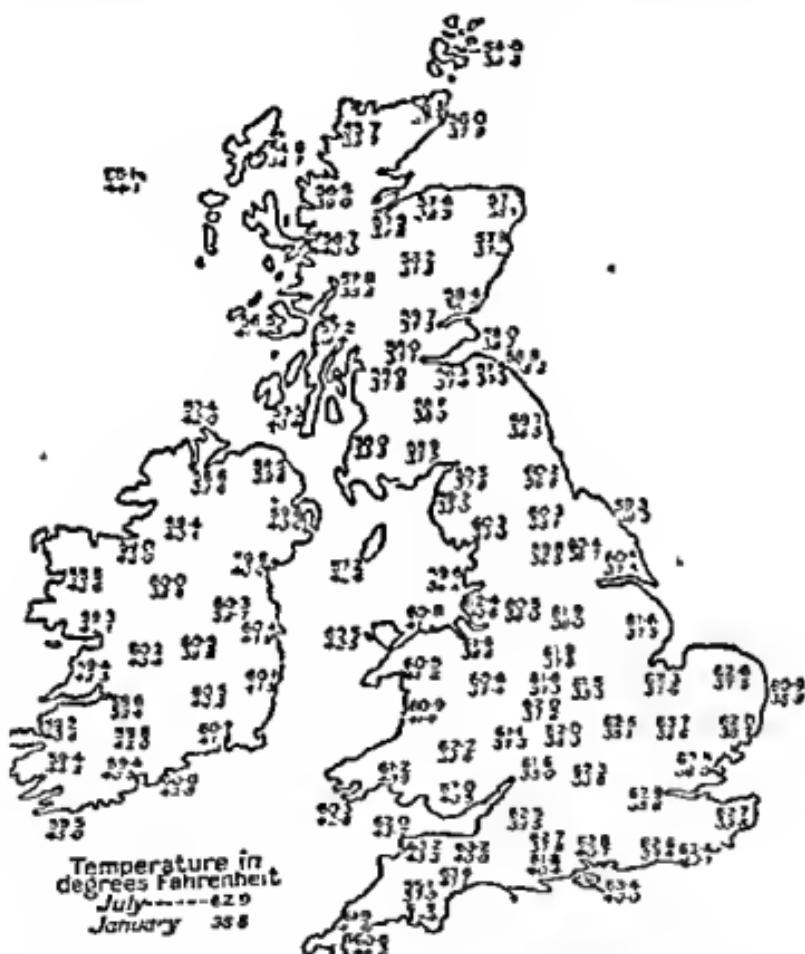


FIG. 95—MEAN TEMPERATURES FOR JANUARY AND JULY

and people connected with the work of a great naval station.

Away to the east is the city of Bristol, set far into the land, a great port in the days when ships were smaller and, even now, the largest city in the region with which this chapter deals.

the manufacture of white paper, alum, and ultramarine, and is employed to adulterate flour and artificial manure, and to give weight to carpets" *

The mines, the quarries, and the sheep find work for a certain, but not very large, number of people. As there is no coal except near Bristol, there are no important manufactures. The region, then, is mainly agricultural, and of the different forms of agricultural occupation that of dairy farming is the chief. But there are still other ways of getting a living, and some of these will appear in our account of the towns.

Towns.—There is a marked absence of big towns, except a few on or near the coast. What kinds of towns should we expect to find in such a land as we have seen this to be?

The *market towns* are small and, as elsewhere, are placed where they are most easily reached by most people. We will consider three of them.

In Cornwall there are mountains and lulls almost all the way down the coast, but at one point the valleys of two small streams, the Camel and the Fowey, offer a way across the barrier. The two valleys are separated only by a low pass, and in the pass is *Hodmin*, the most centrally situated town in the county, and chosen as the county town as well as a market town.

Between Dartmoor and Exmoor a road leads south east through the plain of Devon, between Exmoor and the Blackdown Hills comes the road from Bristol through the Vale of Taunton, near the coast there is a road round the south side of Dartmoor. All these natural roads lead to the estuary of the *Eve*, the man-made roads which follow the natural routes will therefore meet somewhere in the small plain round that estuary. A suitable junction is, as we have seen elsewhere, provided by the bridge at the head of navigation.

At that point is *Exeter*, market town and county town of Devonshire. Devonshire is the land that could

* *Geography of Cornwall*, W. M. Carey, Geographical Teacher, No. 30.

EXERCISES

1. Name different rocks mentioned in this book; say where each is found and describe the country where each is found.
2. Describe the counties of Ayrshire, Perth, and Devonshire, saying why you think the boundaries of each run where they do.
3. From Fig. 21 copy the temperatures for July on to one map and those for January on to another and draw the isotherms in the same way as contour lines were drawn on Fig. 21. What do you notice?

most easily be governed from Exeter. The city is on a hill, a good defensible position. Romans, Saxons, Normans all had camps here in turn. As the centre of an agricultural region Exeter makes agricultural implements, and it is the chief cattle market of the south west.

Exeter is one of the most interesting towns in England, with its beautiful cathedral, castle ruins, and examples of Elizabethan houses.

The most fertile part of Somerset, especially before the draining of Sedge moor, was the valley of the Tone. Being the most fertile part it had the most to sell so that the valley had the most important market town. The market is placed where the road from Bristol to Exeter between Exmoor and the Blackdown Hills

crosses the river and is called Taunton i.e. Tone town. Such an important passage was guarded by a castle, and the castle guarded town became the county town of Somerset.

Fishing towns are as far out as possible, and it is evident that the peninsula, with its deep estuaries for the shelter of boats is well situated for fishing, which is, indeed the oldest industry of the region.

In the neighbouring seas there is an abundance of fish, chiefly mackerel, plaice and pilchards, there is however, no big fishing ground like the Dogger Bank, and



FIG. 91.—MAP TO SHOW THE POSITION OF EXETER

CHAPTER XVI

THE ENGLISH LOWLANDS

We have already seen how the people live in the north and west of England. Here a good part of the land is mountainous. The low land in England, on the other hand, lies in the centre and the east, and just as the low land of Scotland is the real Scotland so the low land of England was for long the real England. Some of the districts in East Anglia and the south east have already been described. We have now specially to consider the centre.

Relief.—The centre is not flat, but gently undulating, and a bicycle ride across it say from London to Chester, is a never ending series of ups and downs over hills which though low may be quite steep. In the north west this central lowland comes to the sea between the Pennines and the Welsh Highlands and in the south west between the Cotteswold Hills and the Welsh Highlands. These passages are too wide to be called gaps, they are known as gates—the *Midland Gate* in the north west and the *Severn Gate* in the south west. The north eastern outlet of the plain, between the Pennines and the higher ground farther east is called the *Trent Gate*.

Across the lowland run belts of higher ground. Of these belts two are more important than the rest.

As we have seen (Chap V, p 64) there is a long low, flattish ridge of chalk, running in a north easterly direction from Salisbury Plain, a plateau 500 feet above sea level. This ridge is very much like the North and

none of the fishing towns are as big as Grimsby or Yarmouth

About the end of February or the beginning of March large quantities of *mackerel* begin to appear in the neighbourhood of the Lizard, giving rise to the spring mackerel fishing. The mackerel are caught by means of drift nets, and landed chiefly at Newlyn in Mounts Bay.

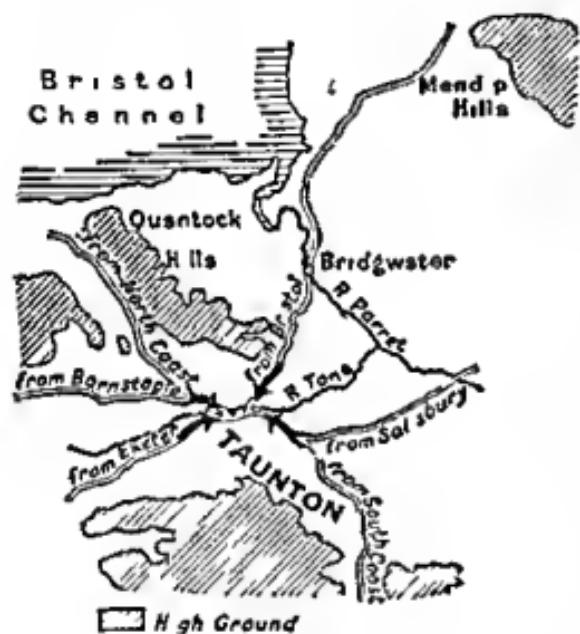


FIG. 92.—MAP TO SHOW THE POSITION OF TAUNTON.

10 inches long. It arrives off the coast of Cornwall in July and August, and again in October and November. Pilchards are caught both in drift nets and in seines by methods that have not been altered during the last three hundred years. The following is the method of seine fishing, by which pilchards and small mackerel are caught.

About the time the fish are expected watchmen take up their places in little watch houses which are situated on high points along the shore. When the men see a

similar fishery on the north coast in the mouth of the Bristol Channel; the boats engaged in this industry come chiefly from St Ives. In the summer mackerel are caught east of the Lizard; the crowds of fish are smaller, and they are caught by seine nets.

The *pilchard* fishery is older than the mackerel fishery, but it is not now so important. The pilchard is a member of the herring family, and is generally about

South Downs in the south-east. It is highest in the section known as the Chiltern Hills.

In Lincolnshire the ridge runs in a northerly direction and forms the Lincolnshire Wolds. It curves to the



FIG. 96.—THE LOWLAND OF ENGLAND

east in Yorkshire to form the Yorkshire Wolds and ends, in the sea, at the bold steep cliffs of Flamborough Head.

To the west of the chalk ridge is another long, low, flat ridge made up chiefly of a yellow kind of limestone which is not so hard as that of the Pennines and Mendips. It is full of little rounded grains each about as big as the head of a pin and is called egg stone,

particular kind of brown patch on the water they shout as loudly as they can, and in a few moments the fishermen are in the boats and off to sea.

They take with them a big net, the seine, something like a drift net but with smaller meshes. This net is attached to a strong rope, one end of which is in the boat, while the other is fastened to a capstan on shore. The fishermen row round the outside of the shoal and drop the net into the water. After they have surrounded the shoal they take the free end of the rope ashore and fasten it to another capstan. Then, both capstans being turned, the net is pulled closer and closer to the shore, and the fish are shut in between the net and the land.

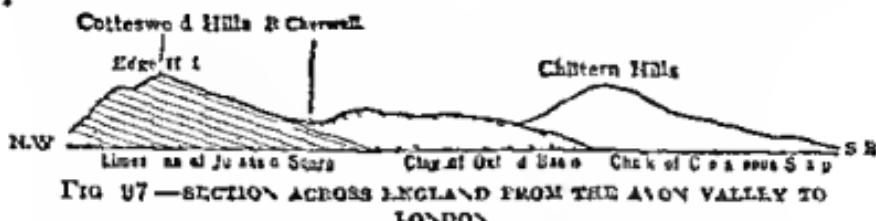
On one occasion as many as 24,000,000 pilchards were taken up at a single haul, but as the haul was too large to be eaten or packed up and sent away, much of it was wasted, and the greater portion of the fish was spread on the neighbouring fields as manure.

The Cornish fishing season lasts all the year round. March—June, mackerel, July—December, pilchards; January—March, herrings. *St Ives* is the chief centre of the herring fishery, and exports annually, on the average, about 6,000,000 fish, which are sent to English markets by rail.

Bearing in mind that *packet stations* are as far out to sea as possible, and that the south west peninsula is very far out to sea, we might at first expect to find here a number of important packet stations. There are, however, few such places in the peninsula, for the simple reason that it is on the way to nowhere. Packet stations are on peninsulas, but not on all peninsulas. People from Ireland go to Stranraer, Holyhead, or Fishguard. Passengers from the Continent cross the Channel where it is narrowest, and land at Dover, Folkestone, and Newhaven. But ships from America with passengers bound for London, do sometimes stop to put them and mails ashore at *Falmouth*.

Falmouth has a splendid harbour formed by a drowned

the oolite. The chief part of this ridge is the Cotteswold Hills. The ridge runs, like the chalk ridge, from south west to north east and extends from Dorset to the Cleveland Hills in north Yorkshire. Both ridges



have a very steep slope to the west, such a steep slope is called an *escarpment* or in a shortened form a *scarp* and that part of England between the east coast and the western edge of the oolite is called the English Scarp lands. Both ridges have a gentle slope, the *dip* slope leading towards the east. To the west of the oolite ridge and in between the different ridges are lowlands.

West of the oolite is a lowland of red soil red sandstone and a kind of red clay or marl the same kind of material as is found in the Eden Valley. Parts of it rise to a height of 700 feet but on the whole the district is open and communication is easy.

Between the oolite and the chalk there is a valley filled for the most part with clay and sometimes called the Oxford Clay Vale or simply the Clay Vale. It runs like the ridges south west to north east and ends on



FIG. 98—DIAGRAM TO SHOW THE VALUES OF THE CENTRAL LOWLAND

valley, and it might be a much more important packet station than it is if it were not for the fact that the railway connection is not really very good. The high land causes the line to wind about a great deal or to pass over steep gradients. These difficulties make the journey a slower one than it would be if the land were flat and the time saved by landing at Falmouth is so little that it is hardly worth the bother. But this is after all, only a result of the fact that it is not worth while to improve the route. It is said that the fastest ocean liners can reach London almost as soon as the express train from Falmouth.

But there is a town which has been partly a fishing village, partly a market town, and partly a port for some centuries, and which is now really made up of three towns, one of which is a naval station. This town is usually called Plymouth, but includes Devonport and Stonehouse as well as Plymouth.



From all the heights of Cornwall and Devon streams descend to the sea, and in doing so have worn deep valleys. The coast has sunk somewhat and drowned the lower portions of these valleys so that there are many good harbours all round the peninsula. When men began to look west rather than east it was found difficult to push westward along the English Channel against the westerly winds and it was from the fishing villages of Devon and Cornwall that seamen started to cross the Atlantic. Drake was a Devonshire man, and the *Mayflower* set sail from Plymouth.

The Tamar and the Plym are two streams whose

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the north-east in the Fen district round the Wash, where the valley is so low that there is little natural drainage and where for long the land was a morass.

Between the Chiltern Hills and the North Downs is another clay plain—the London Basin, while another clay plain, the Hampshire Basin, lies to the west of the South Downs. The Weald between the North and South Downs is partly clay and partly sandstone (see p. 22).

The valleys of the lowland differ from those among the moors and mountains. They are broad, not narrow, their sides slope gently and not steeply. Very often the valleys are so broad and the slopes so gentle that they cease to look like valleys to the untrained eye. The rivers of the lowland are slow, and their banks are fringed with reeds and rushes. Mountain streams flow rapidly, and as they pass over hard rocks they are usually bright and clear, lowland streams flow slowly, and as they pass over soft soil they are usually rather muddy.

The rivers for the most part flow between the ridges we have spoken of. The Itchen and Test flow to the sea over the surface of the Hampshire basin. The Trent passes between the Pennines and the oolite range and flows north east through the red plain into the Humber.

The Severn comes out of the Welsh highlands, passes between the Cotteswold Hills and the hills of South Wales, and flows into the Bristol Channel. An important tributary, the Warwickshire Avon, flows south west through the red plain to join it.

The Great Ouse flows north eastwards through the Clay Vale and the Fens into the Wash. We might expect that another river would flow south westwards, but instead of that the Thames, after flowing north east over the plain for some distance, cuts straight through the chalk ridge in a rather deep gap and then flows over the London Basin to the sea.

The reason for this is interesting and the result important. It is supposed that a very long time ago, long before the Ice Age, the lowland of England had a

much flatter surface than it has now, and had all a gentle slope to the south-east; the lines of hills were not developed, so that streams flowed fairly straight over the surface. Very slowly these streams carried away some of the surface, particle by particle. The clays were carried away most easily, and the chalk and sandstone not so easily, so that the clay lands got lower and lower, and the limestones, which were not eroded so quickly, stood out more and more above the level of the clays. The Thames was one of the streams. Just where it crossed the chalk belt it wore a valley, now called the Goring Gap, which for a short distance looks almost like a dale, but elsewhere the chalk was not worn away to nearly the same extent, so the Chiltern Hills and the White Horse Hills remain. Nowhere else do we find a stream flowing from the oolitic ridge through the Chilterns. The Great Ouse has gradually grown backwards and caught or captured the headwaters of the other streams which flowed from the oolite further north-east than the Thames. But there are gaps in the Chilterns where such streams used to flow, and they are little lower than the level to which the land had been worn when the streams which were there ceased to flow through them. These gaps without rivers are called *wind gaps*, though the name is not a very good one, to distinguish them from the *water gaps* through which streams still flow. As we have seen, p. 26, there are gaps in the

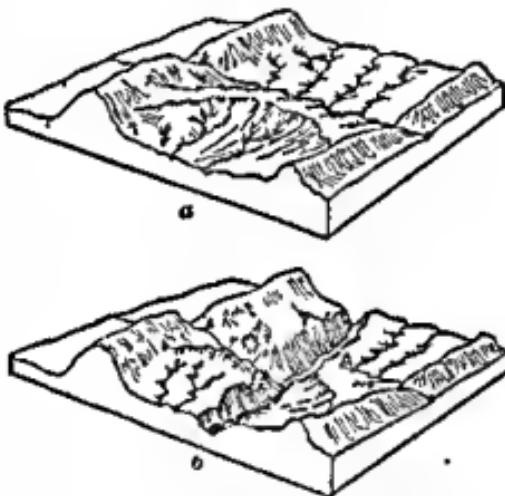


FIG. 99.—DIAGRAMS TO ILLUSTRATE RIVER CAPTURE.

have remained quite small, but one, *Derby*, has become a big town.

Some of the Danes who entered by the Trent passed by Nottingham, and turned up a side street, as it were, the Derwent. The Derwent helps to drain the Peak District, and is the principal tributary of the Trent on the left bank.

Derby is on the plain near where the Derwent leaves the hills, at the back were water power and hill defences, in front land easy to cultivate and travel over when once the trees of the forest had been destroyed. The Trent and some of its tributaries provided water ways.

When the railways came they followed the lines of the old roads across the plains and through the valleys, and Derby, like Leicester, Nottingham and Chester became a railway junction, it is on the Midland Railway, and the centre where locomotives and railway carriages are made for that line.

Such towns as Nottingham and Derby owe their existence to the fact that rivers were easy to move on in boats. Other towns, also on rivers, owe their existence to the fact that rivers are difficult to cross if one has not a boat and there are no bridges. In that case people look for *fords* or shallow places in the river or stream where it is possible to cross on foot or on horseback, and the word "*-ford*" is part of the name of many towns to the site of which roads converged because of an easy crossing. *Stafford*, for example, was at an easy crossing place over the river *Sow*, a tributary of the Trent. Being in the centre of a plain it naturally became a market town. It is on one of the western clay belts with grass and cattle, many of which are fattened for meat. Stafford is a convenient centre to which the hides could be brought, and these have given rise to a leather industry and the manufacture of boots and shoes.

Another most important ford was *Oxford*, in the centre of the valley of the upper *Thames*. It is in a small gap in a low ridge. Here meet the valleys of the *Thames*

North and South Downs. Some of them are wind gaps, and some water gaps, which have been formed in the same way as those of the Chilterns.

Fig. 99 (a) and (b) show two stages in the process of river capture described above. The main stream shown in Fig. (a) has disappeared in Fig. (b) above A. When the process has reached a further advanced stage only a wind gap will remain in the nearer ridge.

Climate.—We already know something of the climate.

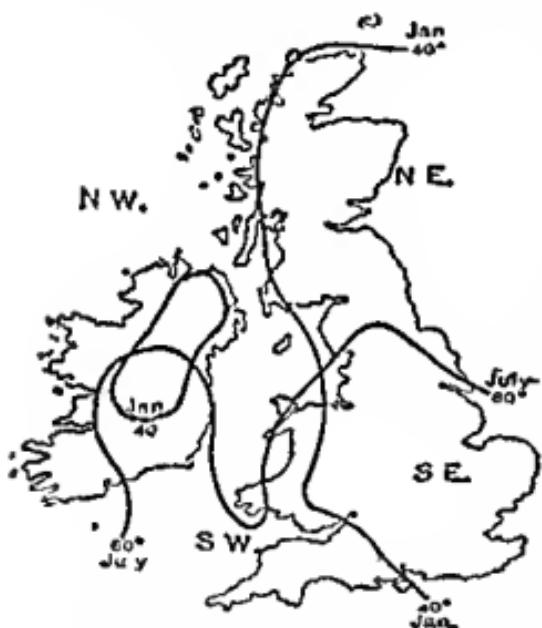


FIG. 100.—TEMPERATURE REGIONS.

For one thing there is no part which is cold simply because of height, for no part of the lowland is high. We have seen also that the west (Chap. I Ex. 3) is warmer than the east as being nearer the middle of the winter gulf of warmth, and, indeed, that the English plain has the most extreme climate in the British Isles. It is warmer in summer and colder in winter than any other district of the same height. From Chap. XV Ex. 3 we see

that the isotherms for January run north and south instead of east and west as we might expect. The east is colder than the west and the land is colder than the sea. The isotherms for July do run roughly east and west, but they bend south over the cooler sea and north over the warmer land. The highest summer temperature is in the south east. Fig. 100 is a map of the British Isles with two isotherms on it, the January isotherm for 40° F , and the July isotherm for 60° F . Between them they divide

and Cherwell, and along the ridge was a road from London. Water roads by the rivers and land roads to the ford met at Oxford, so that it was a most important centre for a market and other things. It was a centre of learning as well as for produce, and here grew the ancient university.

The old towns were naturally those which became county towns when Alfred the Great and his successors divided the land into counties, chiefly in connection with

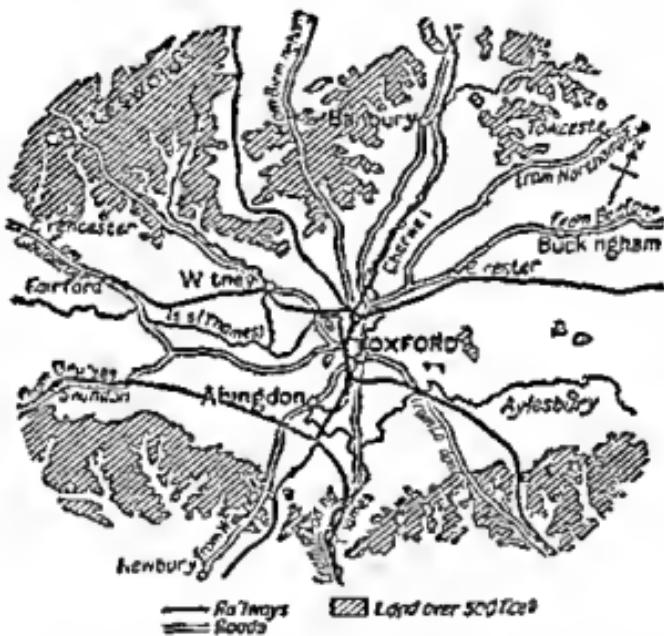


FIG. 101.—MAP TO SHOW THE POSITION OF OXFORD

their military systems. They shared the land between the largest of the little market towns, giving to each centre an area that it could conveniently govern. The map shows that most of the counties in the lowlands are named after their chief towns, and that their boundaries are very irregular and seem to have little to do with the physical features, though in some cases the boundaries run along high ground between the river basins.

Most of the midland counties were formed by adding

the islands into four regions, of which it is seen that the English lowland has the most extreme climate

We have seen also that the west of the British Isles is the wettest and that the higher parts on the whole receive more rain than the lower, and we saw that the fact that we received most of our weather from the west was the cause of this. The English lowland receives rain from wind currents which converge towards each other. The eastern portion of the lowland is considerably drier than the west.

Houses and Crops—Now we can see how people may live on the lowland. As a matter of fact they live rather differently in different parts. Even in the matter of houses it is wonderful to notice the varieties. We find the old whitewashed timber-framed house of the Midlands where there was forest, the red sandstone houses and castles of Chester and Nottingham on the red plain, those built of Bath stone in the south west, and the flint-faced walls of the chalk country.

Of the Oolitic area Cobbett has drawn a picture in his *Rural Rides*. Speaking of the Cotswolds he says

All along here the land is a stiffish white loam upon a bed of soft stone, which is found at various distances from the surface, sometimes two feet and sometimes ten. Here and there a field is fenced with this stone laid together in walls without mortar or earth. All the houses and outhouses are made of it, and even covered with the thinnest of it formed into tiles. The stiles in the fields are made of large flags of this stone, and the gaps in the hedges are stopped with them. And he adds 'Anything quite so cheerless as this I do not recollect to have seen, these stones are quite abominable.'

On the clays the natural building material is brick, and this is now being used almost everywhere for house building even where the older dwellings may be of stone or timber or the larger business premises may be of iron concrete. But brick is not the same everywhere, it may vary in quite a short distance from the warm red

together a number of smaller areas, and the edges of the bits have not much to do with the directions of rivers or hills. The shapes of the bits really depended, in many cases, on mere convenience in cultivating the land (p. 65). The county towns are mostly on the rivers, and the rivers run more or less through the middle of the counties with the county town in the centre of the valley. Thus Chester is on the Dee towards the centre of Cheshire, Shropshire, Worcestershire, and Gloucestershire have the Severn in the middle; Warwickshire is divided by the Avon, and the same is true of Bedfordshire and the Great Ouse, and of a number of other counties.

Note that Oxford is not the centre of all the lowland that might have been governed from it, this lowland was so large that it was cut in two and Oxford got only one half.

Manufacturing Towns.—But even in the agricultural lowland some towns have not remained agricultural centres. We have already seen that Nottingham and Stafford and Lincoln are the sites of manufactures of various kinds. The presence of coal has specially stimulated the growth of some old towns, and even villages, which were not market towns.

To the north and south of Stafford there are coalfields. On the northern one china and other kinds of clay were found; the coal was used in making all kinds of earthenware, and the district was called the Potteries. The chief towns on the coalfield, *Stoke-on-Trent, Hanley, Burslem*, and *Newcastle-under-Lyme*, are so close together that they form one big town, dirty and ugly like the factory towns. The manufacture of fine pottery was founded 150 years ago by Josiah Wedgwood, and the deposits of china clay have long been exhausted, supplies are now obtained from Cornwall and Devon. The local poorer clay is used only for coarse things like tiles, bricks, and drain-pipes.

On the south Staffordshire coalfield iron ore was found; hence the smelting of iron ore and the manufacture of iron goods are old and important industries. The district,

brick and tiled roofs of Grantham to the depressing yellow brick and slate of Peterborough while both contrast with the stone built Stamford and the villages of the oolite which lie between them. All give character to different districts just as much as do the slate slabs of Wales or the solidly built white sandstone houses of Bradford or Edinburgh and the granite of Aberdeen.

Rich deposits of iron have been found in some parts of the oolitic range and this again has affected ways of living. Where both coal and iron are close at hand as in the Cleveland district of Yorkshire, great towns have grown rapidly. For instance, in 1801 there were only four farmhouses at Middlesbrough. To day Middlesbrough has a population of over 131,000, and produces two and a half million tons of iron each year.

The soil and climate also affect the uses to which the land may be put. When dealing with East Anglia it was pointed out that the dryness of the region was suitable for wheat. For all that was said to the contrary the farmer might have grown nothing else but wheat, there is, however, much more to be said. Any one with a garden knows that it is not possible to grow, successfully, the same crops on the same plot year after year.

The East Anglian farmer, therefore, grows his wheat in rotation with other crops and also rears animals at the same time. He engages in what is called mixed farming. In some parts of the country the following is the rotation adopted.

First of all roots e.g. swedes or turnips are grown. As there is a fair space between the rows and the plants it is easy to clear the ground of weeds. The roots are followed by barley mixed with clover and grass. The barley is harvested in the autumn while the clover and grass give hay in the following summer. When the hay has been gathered animals can be turned into the fields to graze. The next crop is wheat.

The advantages of this system of rotation of crops and of mixed farming are many. Amongst them we may

note the following: 1 As each crop selects a different kind of food out of the soil the exhaustion of the ground does not take place so rapidly as if only one kind of crop were grown

2. Work is distributed throughout the year "After harvest the farmyard manure is carted on the land. This is followed by wheat sowing. In the winter there is the stock to be fed. The spring brings barley sowing, the early summer the cleaning of the land for the roots. Then follows the hay harvest and the hoeing of the roots, and by this time corn-harvest comes round once again" *

3 Then each kind of plant has its own kind of pest which feeds on it. If a crop is only grown once in three or four years on the same field many of the pests of any particular kind of plant will die in the meantime

4 And, finally, as the farmer, on the system described above has hay, meat, barley, and corn for sale, the failure of one product may be balanced by the success of another. He never has "all his eggs in one basket"

All this implies continuous work without any break. Further, "turnips, swedes, and mangolds have to be eaten by cattle or sheep, and as they are ready by the end of October they have to be consumed during the winter, otherwise they would require enormous space for storage and run serious risk of deterioration. In these drier districts, therefore, winter feeding of animals is the rule. The winters are cold and animals are precious; therefore animals have to be kept indoors. This means large farm buildings and attendants living close by. The most convenient arrangement is for the farms to radiate out from the village and have their buildings as near the village as possible. This arrangement is very common in Norfolk, where winter feeding is widely practised. It leads to a highly developed village life" †

Contrast this life with that in the west of the lowland

* *The Story of a Loaf of Bread*, T. B. Wood.

† "Regional Factors in Agriculture," Russell, Geographical Teacher, Spring, 1920.

traverses the lonely Pennines, and then runs down the long valley of the Eden to Carlisle

Because Britain is a long narrow island running north and south the longest lines run in the same direction. The only other long lines possible are those that go west.

The Great Western runs along the low flat land of the Lower Thames valley and near to Reading passes through the chalk hills by the Goring Gap, the lowest and easiest way through them (p. 215). It keeps on the edge of the White Horse Hills as far as Swindon. Here it divides, like the North Western at Crewe one branch for Wales and one for the south west of England. The Welsh branch of the Great Western Railway passes under the Bristol Channel by the Severn Tunnel and by means of the south coastal plain arrives at Fishguard. The south west branch goes through Bristol and runs near the coast to escape the Mendip Hills. It makes due south for Tounton and follows low ground to Exeter. It goes round and not over, Dartmoor, and runs on the south side of the Cornish highlands to Plymouth, Ilfracombe, Penzance and St Ives. A shorter route now avoids Swindon by making use of the valley of the Kennet.

The London and South Western is more direct than the Great Western but has steeper gradients. It crosses the chalk north of Aldershot, and keeps on high ground nearly all the way from Basingstoke to Salisbury. Between Exeter and Plymouth the line turns inland and runs round the north side of Dartmoor fairly close to the moor. Between Okehampton and Tavistock the country is very hilly.

The Great Eastern is the railway for East Anglia and for the fishing towns south of the Humber.

The South Eastern and Chatham sends two longish lines to the south east. One runs along the low ground between the North Downs and the river, the other runs on the south side of the North Downs. This is the line that joins London to the orchard lands and to Dover and Folkestone.

The western belts, or western portions of belts, of clay have a heavier rainfall, and in great part are in consequence too heavy to work, and are given over to grass, as are some of the heavier clays farther east. On this grass many cattle are fed. As the climate is more equable cattle can be out of doors all the time, and the farms are more scattered. It is not dry in summer as it is in the east, so that cattle can be fattened all through the spring and summer. But this is not very strenuous or continuous work, and leaves time for leisure which many of the country folk spend in hunting. This in turn leads on to horse-breeding. Where the clay belt dips in the east to the Fens there is much less rain, and since the area has been drained it has been found extremely suitable for potatoes and for wheat.

Between the heavier clays of the west with cattle and the drier lands of the east characterised by wheat production, many districts are given up to different forms of agriculture or even market gardening where the soil is a good mixture of clay and sand and has been well manured and where there are good railway connections with districts of large population. In the London clay basin with a large population in the centre which requires milk the land is very largely given over to grass and used mainly for dairy farming, indeed, many of the more distant grass lands of the west and north west of England help to supply the demand. The chalk belts are in parts covered with a layer of clay, but elsewhere the soil is thin. On the clay lands of the chalk grow woods, mainly of beech, which in days of old fed large herds of pigs and nowadays may provide timber for the manufacture of furniture, e.g. chairs at *High Wycombe*. On the down lands, as we have seen, the sheep is the characteristic product and the shepherd is the person of importance.

It is obvious then that there are many ways of living on the English lowland.

Settlement and Roads — In order to understand what

which is known as the Black Country, is dirty and smoky and has almost more chimneys than trees. By day it is a very unpleasant land to travel through, but at night, when the sky is aglow with the light from the furnace fires, it has a certain picturesqueness of its own.

As the Black Country is so far from the sea the people make chiefly small things in which the cost of labour is greater than the cost of iron. Things like watch springs, nails, pens, needles, and bicycles, etc., have high prices and low weight, so that the cost of carriage is small compared with the value of the goods.

There is one curious fact about the big towns of the Black Country. They are on high and not low ground. When iron ore was first smelted in this district, as in the Weald and Hallamshire (p. 83), it was smelted, with charcoal, and the forests from which the charcoal was made were themselves on high ground. Then, also, it is difficult to keep a charcoal fire alight, but high ground gets more wind than low ground, and the best position for the furnaces was on the tops of the hills.

The chief town of the Black Country is the city of Birmingham, which, so its name tells us, must have begun as a little Saxon village. It is not on the coalfield, but near to the Forest of Arden where the charcoal was made. In Birmingham are made pins, needles, metal buttons, screws, tools, guns, bedsteads, fenders, and many other things of this kind. It is the second city in England in population, and it is called the "capital of the Midlands," so its inhabitants are very proud of it.

Railways.—Just as it is the old towns which, on the whole, have remained important as centres, so the old routes have remained, the railways follow the lines of the roads. This is partly because the routes themselves are the natural easy ways, and partly because the railways have been made to connect the old towns. The Great Northern Railway follows the line of the Great North Road, the London and North Western Railway those of the west coast road to Scotland and the North Wales

is here now we must take account of some past condition, very many of our towns and villages and roads owe their present positions to what happened or existed long ago. In the lowland districts movement is easy and land is plentiful and fertile so that it is possible for man to live in almost any part of it. If, however, we go back to the Stone Age we find that the majority of the stone-using men lived on the top of the bare chalk or other uplands, and not in the then wooded or marshy lowlands. They were hunters and their weapons and tools were made of the flints they found abundantly in the chalk. Also, where the soil was poor and vegetation was scanty it was easier for them to make a clearing or to move about, they had not tools with which to cut down the forests or drain the marshes of the lower and damper ground.

The valleys and lowlands were either swampy or covered with trees and the only tracks were along the ridges. In the forest there were wolves and other fierce animals and in the swampy parts were treacherous bogs. Upon the tops of the downs it is still possible to see where these early men lived to find the mounds with which they covered their dead to trace the floors of their huts and even to tread the tracks which they, the first road makers made in these islands.

As time went on man became more civilised and could move more easily and conquer more difficulties successive generations then descended into what are the more fertile parts. At different times Britain was invaded by different peoples. They arrived by water and travelled by water using the rivers to carry them as far inland as they could get. They lived on the banks of the rivers for there the water supply was plentiful. They were not quite so badly off for roads as the men of the Stone Age but the roads for centuries were little better than tracks. In wet weather these tracks were almost impassable, at all times it was difficult to keep them in order.

It was not till the end of the seventeenth century that good roads began to be made. Even as late as that they

road to Ireland ; the Great Western that of the Bristol Road

But it is even more necessary for railways than for roads to follow gentle slopes, so the gaps in the hills (p 215) are even more important for railways than for roads

The names of the railways, Great Northern, Great Western, etc, indicate the directions in which the railways radiate. As the Lower Thames Valley is surrounded by hills, each railway has to get over, through, or round



FIG. 102—MAP TO SHOW HOW RAILWAYS NORTH OF LONDON USE THE GAPS IN THE HILLS

them. In some places the railway climbs the hills, elsewhere it burrows underground in tunnels or makes use of river and wind gaps.

The East Coast route to Scotland runs almost due north over low ground, crosses the Chiltern Hills by a "wind gap" at Stevenage, passes through the bread lands and round the end of the limestone hills to the grain market of Grantham. It then runs through the low land in the Trent valley and the fertile Vale of York to the

were so bad that men and horses were frequently engulfed in the pools which were to be found in the middle or to the side of them. But waterways were always smooth easy to travel on and never wanted mending.

The early settlements on the banks of the rivers must certainly have been quite small. Some of them have now entirely disappeared, some are still small and of little importance, others have grown into large and wealthy cities.

The Romans — In 55 B.C. Britain was invaded by the Romans. They were great road builders and they built a great system of roads all over England. They usually carried them as straight as they could and when possible kept to the high ground in order to avoid the woods and marshes. These roads were so well made that where they run on level ground they are in use to this day. One of the chief Roman roads was Watling Street which still runs almost unbroken from Dover through London, St Albans and Towcester to Chester.

Two Roman roads crossed at one point on the river Soar, one of the tributaries of the Trent, and there a bridge was built. Up to this point small boats could sail and here at the meeting point of roads and the Soar was a Roman camp, the site of modern Leicester.

The low grass lands round Leicester supply food for cattle, this has given rise to the tanning of leather and the manufacture of boots. The sooty rulge supplies food for sheep, the Leicestershire breed of sheep produces wool of fine quality, and this has given rise to the manufacture of woollen hosiery, the chief manufacture of Leicester.

On the west side of the lowlands there are many traces or remains of Roman towns and camps. Wherever a road led into Wales a camp was put to guard it. Two of these, Chester controlling the northern road and Gloucester controlling that on the south, were noticed in Chapter XIV.

There are others. Let us consider Worcester. One

A branch line of the London Brighton and South Coast Railway uses the Mole Gap and the Adur Gap, but the main line crosses the highest parts of the North Downs and the South Downs by tunnels. This line is shaped like a T, with Brighton at the centre of the T. The cross part extends from Portsmouth to Hastings. On the west it runs along the low ground between the South Downs and the sea. On the east there is at first no lowland on the coast, and the line has to go inland to Lewes and run behind the Downs.

All these routes are really the old routes to the old towns.

Now the railways are grouped together in four systems, the London and North Eastern, the London, Midland and Scottish, the Great Western, and the Southern Railway. This will probably make very little difference for a long time, the lines will remain as they have been and even the old names of the chief railways will almost certainly remain in common use for many years.

Ports and Naval Stations — We have seen that ports

are all far inland, now we may see where the most important ports of England are. There are five great inlets between which the land projects in peninsulas, and we might expect that there should be five great ports. But one of the inlets, the Wash, is shallow and unsuited for modern vessels, though the old port of Boston was approached in this way. Near the head of the tideway in each of the others however, are the four great ports of



FIG. 103 — THE FOUR GREAT SEA ENTRIES OF ENGLAND

London, Liverpool, Bristol, and Hull. At the heads of shorter recesses are Southampton and Newcastle.

of the tributaries of the Severn, the Teme, leads into the centre of Wales, and the Romans guarded this valley junction with a camp. The exact choice of position was determined by a ford formed of a ridge of sandstone in the bed of the stream. Up to the end of the thirteenth century there was no bridge across the Severn between Gloucester in the south and *Bridgnorth* in the north with the consequence that the ford was much used and roads converged to it on either side. The left bank of the river at this point was high enough to be above flood level and there houses were erected for the use of travellers and a fort erected to guard the ford against the Welsh. Walls and a cathedral complete the usual story.

Because Worcestershire is on the east side of the Welsh highlands the county is fairly dry, and so is suitable for fruit rather than grass. It is very fertile and has not only fruit but other agricultural produce for sale. The central position of Worcester made it the natural market town and, afterwards the county town of the county.

In the neighbourhood there is a good supply of fine cluna clay, this has resulted in the manufacture of "Worcester" china.

Angles and Saxons—Some years after the Romans left Britain various tribes—Angles, Saxons and Jutes—entered this country from the Continent and settled chiefly in the east and south east. Coming as they did across the sea they naturally used the rivers as the easiest ways. One tribe of Angles discovered the Trent, and by its means reached the centre of Britain. At one spot they found a steep rock on the river bank at the point where the river was crossed by the road from the north between the Pennines and the forest and here they settled.

The spot they had chosen gave them waterways on the river, fertile lowlands round about on which to grow food, sufficient rain for farming and an easily defended position on the rock. In the neighbouring forest—Sherwood Forest, afterwards the home of Robin Hood and his merry men—there were deer with which to fill the larder.

Of Hull approached through Trent Gate, Liverpool approached through the Midland Gate, and Bristol approached through the Severn Gate, we have already spoken. There remains London in the south east, where there is no gate of the same kind as the others. The south east of the Lowland is indeed different from the rest of Britain. It is on the south east that the Continent comes nearest to Britain. It is from the south and east and south east that Britain has been approached. Romans and Saxons and Danes and Normans entered Britain on the south east, and French and Germans endeavoured to do so. But though the Continent is nearest Britain on the south east Britain can be entered only by crossing the sea. So it is on the south and east and south east that naval stations are situated.

The natural position of a naval station is almost the opposite of a port and more like that of a ferry town. Harwich is both. From a peninsula it is possible to send naval vessels into two seas. From Plymouth vessels can be sent either into the Channel or into the Irish sea, from Scapa Flow into either the Atlantic or North Sea. From Dover vessels may patrol either the Channel or the North Sea, and at Chatham and Sheerness vessels may be repired in safety.

The positions of some of the other naval stations are not so obvious. Portsmouth is not on a peninsula at all. But we see the importance of Portsmouth and even of Ialmouth *if we remember that Britain could also be approached from the south and that Portsmouth and Ialmouth are the nearest harbours to the great naval stations of Cherbourg and Brest which are on peninsulas.*



FIG. 104. NAVAL STATIONS

and timber for building and for fuel. It was on such a site that *Nottingham* began. When the Normans conquered the country they saw at once the military value of the position and built a castle there, the keep of the castle still stands but is used as a museum.

On the limestone hills there is grass and therefore sheep and wool and the manufacture of hosiery. We have learned that in the manufacture of fine cotton a damp atmosphere is necessary in order that the threads shall not break when tightly pulled. But in lace the threads are not so tightly pulled, and it can be manufactured in a drier atmosphere such as is found on the south east of the Pennines, lace making is an important industry in *Nottingham*.

The position of *Nottingham* on the edge of a coalfield, between an industrial region and a rich agricultural region made it an important market, and later the county town.

It is near the head of navigation and there have been proposals to make it the centre of the canal system of England and connect it up with the *Mersey*, the *Severn* and the *Thames*. It has also been proposed to deepen the *Trent* from *Nottingham* to *Newark* so that sea going vessels could reach the former city. Coal could then be sent from the *Erewash* valley direct to *London* and timber be brought straight from the *Baltic* ports. Such a scheme if completed might make *Nottingham* a port of some importance.

The Danes—After the *Angles* and *Saxons* came the *Danes*, all of whom made use of the rivers some of whom made use of the *Trent*. The position of Danish settlements is often indicated by the word ending—*by* which means a town just as Saxon towns are by the ending

ham " or home. It will be found in the names of many places in the eastern part of the lowlands but there are not so many instances of its use in the west for the *Danes* settled chiefly in the east the part nearest to the country from which they came. Many of the Danish settlements

More recently the menace has been from the east, so *Rosyth* on the Firth of Forth has been made into a great new naval base from which vessels may proceed to patrol all the North Sea.

Finally, London in the south-east, from which Britain can be approached from the Continent, is of special importance, and in the next chapter we have to consider the importance of London.

EXERCISES

- 1 Draw a map of the British Isles and put a dot to stand for each town that ends in "ham" and a cross to stand for each town that ends in "by". What do you notice?
- 2 Trace a map of England showing the counties. Shade all those called after their county towns. Where are they? Why?
- 3 Make a list of towns that are bridge towns. Say what road is carried over the bridge and what river the bridge crosses.
- 4 Draw maps to show the positions of Reading, Crewe, and Swindon.

CHAPTER XVII

LONDON

As we have seen the Thames Valley is divisible into two parts—upper and lower. The upper valley lies between the limestone of the Cotteswold Hills and the chalk of the White Horse and Chiltern Hills, in the centre of this valley is Oxford.

The lower valley is broader and except towards the sea is shut in by ranges of chalk hills, the chief of which are the East Anglian Heights, the Chiltern Hills and the North Downs, in the centre of this valley is London the importance of which we have now to consider.

A Bridge Town—It is difficult, as one threads the crowded streets of the greatest city of the world to conjure up the scene before the coming of man. In places there was a wide forest, “a sea of mighty trees, an ocean of green, through which the Thames wound like a serpent.” In the shades of this forest bloomed violet, primrose, foxglove, daisy and dogrose. More wonderful than the forest were the waters, not the narrow river as we know it, but a broad expanse part river part lagoon. And in this world of tree and river, lake and swamp there was but one point high enough above the low and muddy banks to permit man to make a home when he did come. On that one spot London was born. For in the first place it was possible for the earliest explorers of the estuary to land there, and in the second to settle down and live there. And in the after time when other parts of the valley were occupied and it was necessary to bridge

Southampton to which come many of the Atlantic liners. At one time this plain seems to have been more important than the London plain. At the time when Alfred the Great was king his Saxon subjects lived on and around it. Southampton was his port for the Continent and Winchester his centre of government.

From *Winchester* roads run to many points on the south side of the Downs across the hills into the Lower Thames Valley, to the Midlands and to the east coast. Alfred's kingdom of *Wessex*, that is of West Saxons, found its natural governing centre at *Winchester* which was therefore the capital of England in so far as Alfred was king of England.

Of the four towns York, Oxford, London and Winchester only London has become a really big city. At first it was a question as to whether London



FIG. 109.—HAMPSHIRE AND LONDON BASINS.

Westminster or Winchester. Southampton should be the centre not only of a valley but of the south. Each of these clay basins was open to the Continent. At first there was little to choose between these pairs, each was the centre of a much greater area than a county and indeed for a time it looked as if the organisation of the land would take place from Winchester, Southampton but eventually the centre in the London basin took precedence over the centre in the Hampshire basin. Since then there has never been any doubt as to which city should be the capital. As the northern part of England was added district by district there was no town so important as London so London became the capital of more and more land and grew ever more and more important.

THE BRITISH ISLES

More recently the menace has been from the east, so Rosyth on the Firth of Forth has been made into a great new naval base from which vessels may proceed to patrol all the North Sea.

Finally, London in the south-east, from which Britain can be approached from the Continent, is of special importance, and in the next chapter we have to consider the importance of London.

EXERCISES

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When Wales was conquered there had to be some town from which to govern both countries. Wales, as we have seen, had no natural centre, and London became the capital of England and Wales.

When Scotland was united with England there was no comparison between Edinburgh and London, so London became the capital of Great Britain. And when Ireland was united with Great Britain, no one suggested that Dublin should be the capital of the United Kingdom of Great Britain and Ireland.

At one time there existed, as it were, two Londons, the City of London at and around the bridge and the city of Westminster at and around the more westerly ford. They have since been united by streets, but they are separately governed and they have distinct characters. It was Westminster that was the capital, the governing centre, and it is at Westminster that we still have the Government Offices, the Houses of Parliament, where the laws are made, Buckingham Palace where the king lives, and the Abbey where the kings are crowned.

It has been one of the missions of Britain to people many lands over sea. Australia, Canada, South Africa and other countries have become the homes of many British people. These different British nations make up the British Empire. And an empire, like a valley or a country, needs a business centre. Just because London has always been the capital of the Empire, it has always remained that capital when another piece has been added. For in London are the offices where the work of government has long been carried on and the people who have long been trained in the special business of empire management. And even if a place could be found which was more central than London and perhaps more suitable as a capital, yet it is certain that for a long time, perhaps as long as the empire exists, London would still remain the capital.

If it were proposed to move the centre of the Empire to some other city it would be necessary not only to move

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also all the books and documents, but to erect anew all the buildings necessary, from the Houses of Parliament downaward, and, even more difficult, to carry to that new centre the host of people who have been accustomed to carry on the government. Most difficult of all, a vast number of people would very strongly object to the idea. So London remains the capital of the Commonwealth of the British nations, not because of its roads, its rails, or its sea routes but just because it is.

London is not the centre of population in Britain. There are more people within thirty-five miles of the centre of Manchester than within thirty-five miles of the centre of London. If we could "start fresh" the natural centre would be somewhere in the north of England, but we cannot start fresh now any more than in the past.

There is one other aspect of London of which we have said nothing. It is suggested in the following lines of L. B. Browning —

"I go hence
To London, to the gathering place of souls."

All great cities, and London most of all, are gathering places of souls, places where a multitude of diverse people meet to exchange ideas and in exchanging learn.



FIG. 110.—POPULATION OF THE BRITISH ISLES.

the river in order that the men might meet and barter, it was the lowest place down the river where a bridge could be built

There were two fords further west, one at Brentford and one at Westminster, but a bridge is better than a ford, and when a bridge was built the fords were little used. There was no other point in the estuary where the river could be so easily bridged owing to the low marshy character of the banks. Here, then, was the natural meeting



Here in London there are all sorts of different kinds of people. Towns elsewhere specialise in different things, the people of Manchester are interested in cotton, those of Bradford in wool, those of Yarmouth in fish, those of Portsmouth in the navy, and those of Oxford in learning. But in London there is no one interest that dominates the rest. In the two miles between Westminster and the Bank one may meet at one time or another almost all the men and women who have made names for themselves in Britain, and it always has been so. All political parties, all learned societies, all commercial bodies have their meetings in London. They may have occasional conferences elsewhere, but the regular meetings are in London. London is the amusement centre in Britain. Footballers come to London for football and clergymen for May meetings. They *have* to come. There is no physical compulsion, but every one finds it so convenient that they do come. This is what being a capital means.

In this book we have taken the British Isles piece by piece, and have tried to make clear what each region is like. It is evident that these pieces or regions have different climates, surfaces, crops, and occupations. Even the inhabitants differ, no one would mistake a Highlander for a Yorkshireman, or a Lancashireman for one from the Black Country, Wales, or Cornwall. Their local speech is different, their characters are different, and their ideas of life are different. And yet, together they form one people who live peaceably side by side under the same laws sharing the trials and the glories of a common national life.

Many things have been omitted from this book that some one or other will think should have been included. But enough has been included to enable us to see how many differences can exist in harmony with each other. And yet this lesson has by no means all been told, not even briefly. For it is impossible fully to understand either the position of London or the importance of Britain.

Fort.—The highish ground to which the bridge was built comes close down to the water's edge. It is the first bit of ground along the north bank of the Thames that could be easily defended and on it between the ravines of the Fleet and Walbrook it is probable that an early settlement existed. On this high ground, Celt, Roman and Norman in turn built camps or forts. The Normans built

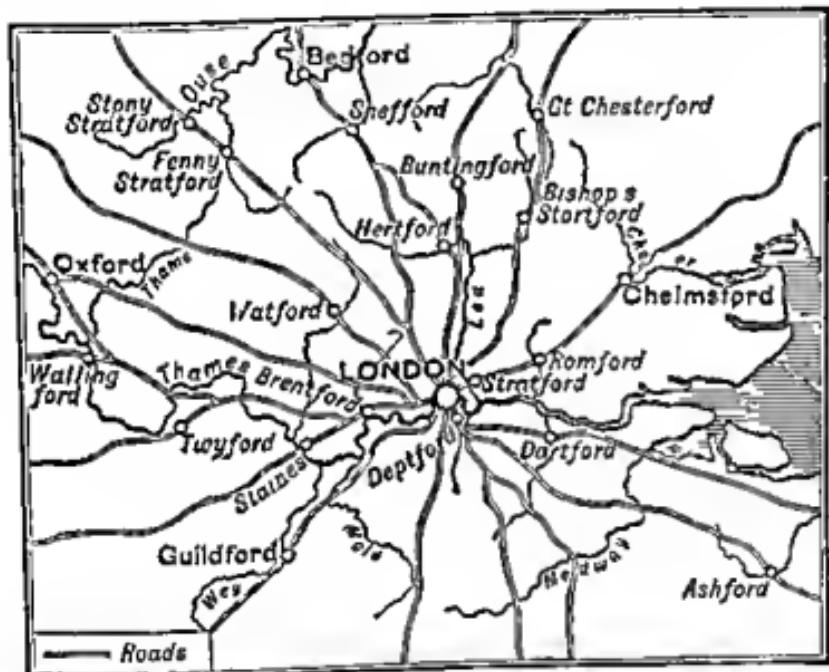


FIG. 106—MAP TO SHOW THE ROADS FROM LONDON AND THE OLD FORD TOWNS.

the biggest and strongest fort of all the Tower of London, which still rises proudly above the ship laden river at its foot. The modern road on one side of it, Tower Hill, preserves in its name the memory of the dry land amidst the ancient marshes.

Local Road and Market Centre—From the chalk hills that surround the valley, numerous small streams flow down to the Thames, and all the roads that went out

without a knowledge of other lands and other peoples Arctic snows and equatorial forests, wildernesses of sand and wide stretching prairies, with the people and animals that inhabit them and the things they produce, supply but bigger illustration of the necessity of that harmony and a co-operation in world affairs that we have seen at work in our own national affairs. To those other countries the next two volumes of this series will be devoted.

EXERCISE

By using the index look up all that is said in this book on (i) Cattle, (ii) Erosion, and (iii) Liverpool, and put together what is said on each in a coherent form.

APPENDIX

TEMPERATURE

	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Aberdeen	57.9	55.3	40.1	43.7	45.2	57.5	56.8	56.2	53.0	47.3	42.1	35.6
Barnstaple	42.3	43.4	44.9	50.3	55.0	60.1	63.2	62.8	59.1	53.4	45.5	41.7
Len Nevis 4,407 ft.	24.1	23.5	24.0	27.6	33.0	39.7	41.1	40.4	38.0	31.4	23.9	23.2
Blackwood Pt.	42.7	42.4	43.3	46.7	50.9	53.7	57.7	57.8	55.8	50.4	46.1	42.6
Boston (54-55)	36.5	35.6	40.3	47.3	53.2	62.2	62.6	61.3	56.7	48.8	41.5	37.5
Cork	42.4	42.9	43.9	47.5	52.2	57.2	59.8	59.4	56.5	50.4	45.6	41.1
Dover	39.8	41.6	47.1	47.5	52.4	53.8	62.7	62.4	58.7	53.0	44.0	41.0
Falmouth	43.4	43.4	44.3	47.8	52.4	57.4	60.3	60.3	57.4	52.0	47.8	43.2
Fort Will												
Hann 33 ft.	39.2	35.9	40.4	44.9	42.9	55.4	55.9	55.3	53.2	46.9	43.7	39.9
Glasgow	38.6	39.1	40.6	45.0	50.3	55.8	58.0	57.1	53.5	47.4	42.6	39.5
Hawes	34.7	35.3	36.4	41.6	47.1	53.0	56.6	53.1	51.0	43.9	35.4	33.0
Oxford	38.4	39.7	42.1	47.0	52.8	58.5	61.2	60.9	56.6	49.4	43.5	39.9
Scar borough	37.7	39.2	40.6	45.0	49.3	55.6	59.2	59.7	55.1	48.5	42.3	35.7
Stornoway	39.3	39.5	37.9	43.3	47.5	52.4	54.6	51.5	52.0	46.7	42.8	32.9

RAINY DAY (IN INCHES)

Barnstaple	2.21	2.79	2.46	2.20	2.16	2.21	2.53	2.23	2.14	1.71	1.95	4.12
Len Nevis 4,407 ft.	19.33	15.67	15.11	6.52	7.72	7.56	10.77	13.52	15.75	15.43	15.27	19.12
Boston	1.51	1.53	1.47	1.37	1.60	1.95	2.35	2.22	2.07	2.75	2.03	1.65
Fort Will Hann 33 ft.	4.20	2.55	6.29	9.65	9.93	8.77	4.92	8.15	6.64	7.32	7.85	9.41

of London had to cross these rivers. Thus was not a matter of great difficulty, for they had shallow fords where man could pass on foot or on horseback. Chelmsford, Bedford, Oxford, Guildford, Dartford, together with many other smaller places trace for us a series of rings of fords around their London centre, while Staines, which means "stones," suggests another method of approach by a causeway.

In all this is seen the beginnings of London at a bridge, as the market town of its own valley, the valley of the lower Thames.

Port.—The Lower Thames Valley has only one big estuary, that of the Thames itself, and therefore the port of the valley must be on this river. Twice each day high tides carry vessels a long way inland, they go even further than London and the port might have been still higher up the river had it not been for the bridge that prevented ships from passing. London Bridge marked the farthest point inland that the ships could reach, and here arose the port of London. In Yorkshire the port for the large cities like Leeds and Sheffield is Hull, in the Lower Thames Valley the chief market town and the port are one and the same place, and hence larger than either might have been had they been separated. The Thames is a convenient entry from the Continent and early became the chief port of the country. And its position as market, port, and road centre in the Lower Thames Valley made it also the natural capital of that valley, even before it became the capital of England.

Natural Road Centre.—London was not merely a road centre for its own valley. Whether man came to England by water up the Thames or by land from the ports of Kent and Sussex all his roads led to London, and hence all his journeys elsewhere radiated out from London. Even in Roman times a number of great highways converged on this spot.

There were Roman roads to the south to Dover, Richborough, and Lymne, to the west through Staines

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and then to Silchester near Reading, with branches for Exeter, Bath and Gloucester, to the north-west through St Albans, to the north to York and Carlisle, to the east to Chelmsford and Colchester. All these roads still, in part, remain with ruins of castles, walls, and gates to mark the track, and the modern traveller who would take the most direct routes to the Continent or to the more ancient settlements in Britain is obliged to pass somewhere or other along a Roman road.

Other roads have been made and old roads shortened by making short cuts here and there so that now, even more than in Roman times, London is the centre of the roads and all the traffic that motor transport has brought to them.

Railway Centre.—As railways, like roads, make use of valleys and avoid hills and as London has been from Roman times the national road centre it is not surprising that it is the chief rail centre. When railways were first made London was already the chief port and market of the country, and so London was the place that it was most desirable to connect by rail with other parts of the kingdom. As a result practically all the great railway lines have their termini in London.

Aeroplane Centre.—The latest method of travelling is by aeroplane. And because London is the centre of roads and railways the aeroplane routes are practically bound to terminate here also. The necessity for wide spaces upon which to land will prevent the aeroplane stations from being, like the railway stations, amongst the houses. They must be in the suburbs where there are fields. Such aeroplane stations already exist at Croydon, Hendon, and Southall.

Manufacturing Centre.—It is often forgotten that London is one of the great industrial cities of the world, where nearly everything is made. Woollen goods are made at Leeds, cutlery at Sheffield, but there is no end to the list of things that are manufactured in London. Most of the industries have special centres, so that at some

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respects London is a mass of little industrial towns. In the East End there are nearly half a million people making



FIG. 107.—AIR ROUTES AS ALLOWED BY THE AIR MINISTRY, MAY 1, 1919

Notice how even air routes converge on London

clothing for the enormous population of the capital and its suburbs; in the north-east there is another town of over 50,000 people making furniture; then there are

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metal workers in the north central district, and potteries, glass works, breweries, and tanneries on the south side of the river.

Banking and Commercial Centre—As London was for long the road centre of Britain and is now the railway centre, it is natural that it became the commercial centre of Britain.

The City of London is devoted to commerce. The ships of the world bring the goods to the central market of the world, and so London is the business capital of the



FIG. 108.—THE MARKETS OF LONDON

world. So much business means the use of a great deal of money. Here are the Mint where money is coined and the Bank of England where money is stored.

London is a commercial centre now, very largely because for long it was the most important commercial centre in Britain. Wool and spices are brought to London because long ago they were brought to London and other things are brought to London because of the facilities for handling them. It is a market not only for the Lower Thames Valley, but for a much wider area. But London is a commercial centre specially because it is the banking

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centre. Banking is really a system of keeping an account of what a man has done with his money. The bank's books show how much he has received and from whom he has received it, how much he has paid away and to whom he has paid it. Small change is used for small transactions, but far and away the greater amount of money is exchanged by means of cheques, which are simply instructions to bankers to take so much from amounts with which the persons who pay are credited and add it to the amount said to belong to those who are paid.

Now just as a bank in a town acts as a convenient centre where record is kept of the amounts that people pay to each other without any coin or note passing, so the commercial centre of London is a banking centre where the chief accounts of the rest of Britain, and indeed of a great part of the world, are kept, and it is all the more important as a commercial centre because it is also a banking centre. The Bank of England is in the very middle of the city, and in all the streets radiating from that centre are the head offices of a great number of other banks.

The Capital — But London is not merely all that we have said it is. London is a capital. It is all that it is partly because it is the capital. Let us see what towns might have been the capital remembering that in early times the only important parts of the country were the lowlands of the east, south east, and centre. In the north east is the plain of York with the Humber for estuary and York well placed in a fertile plain for a centre. Towards the middle of the lowlands is Oxford, chief town of the Upper Thames Valley, also in the centre of a fertile plain with good land and water roads but with no port. In the south east is the Lower Thames Valley with London in the centre of a fertile plain and both market town and port.

In the south as we have seen there is another clay plain penetrated by the long narrow inlet, Southampton Water, at the head of which is a great modern port.

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